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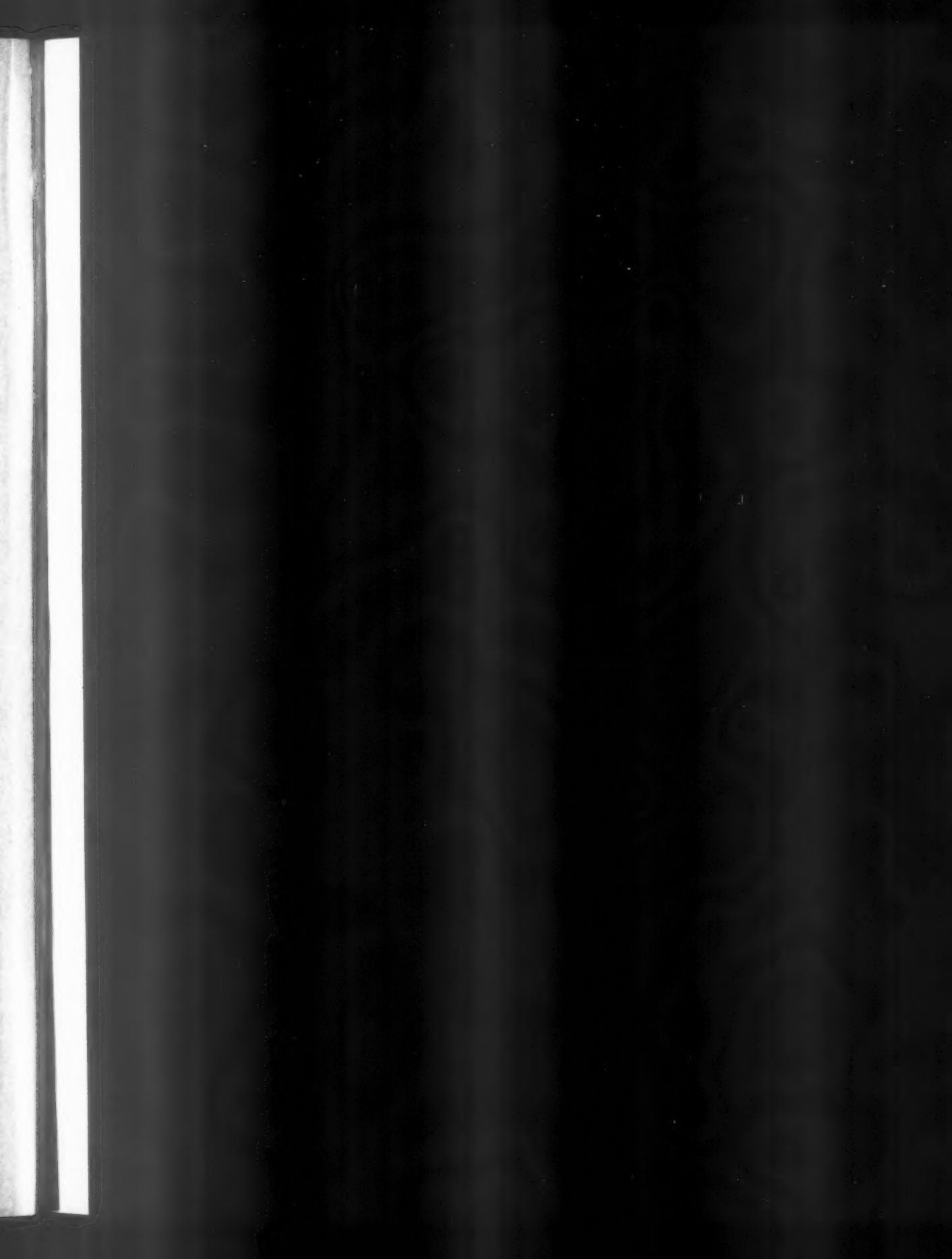


Municipal Engineering

VOLUME XXIII. AUGUST, NINETEEN HUNDRED TWO. NUMBER 2.

SURFACING AN OLD BRICK STREET WITH ASPHALT.

By H. C. Innes, Peoria, Ill.

City roadways paved with brick, granite, cobble stone, or any of our harder sand stones, are very noisy, especially so when the pavement is subjected to heavy trucks, drays and delivery wagons. Every two to four or six inches in the street's length we find a joint, or an opening, and for every six to eight inches in the street's width between curbs we find a similar joint. These joints are often filled with sand, and sometimes a bituminous or grout filler is adopted, yet this filler does not prevent the edges of the brick or granite from chipping or wearing round. Travel then increases the width of these joints, and for each increase in width the ease of hauling for the horse, and our comfort of riding, are materially reduced. The surface soon becomes uneven, rough, and objectionable to travel over. The riding class will soon find this true, and the thoroughfare soon loses patronage. Depressions and cuts are noticeable, and the roadway is in need of attention.

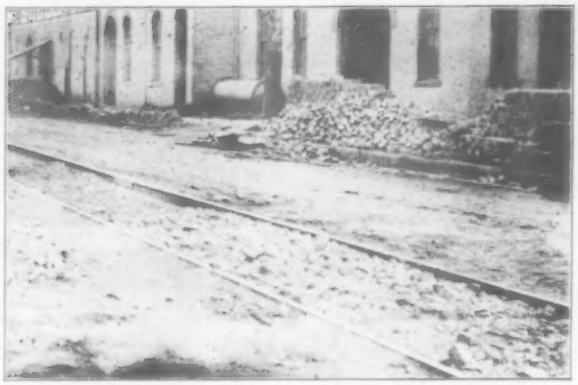
The question of paving is again brought to the property owner's mind. Something must be done to bring back the shopping or traveling public and give the residents a better street. This thought came to the residents of North Water street, in the city of Decatur, Ill., last year. This street was paved with a two-course brick pavement, and was badly out of shape, rutted and crumbling in places. A private contract was made between the property-owners in the block between Cerro Gordo and the Wabash railroad, on North Water street, and the Barber Asphalt Paving Company, who were executing several contracts on other streets in the city at that time, to surface this old brick street with asphalt.

This street is occupied by an electric car track, which was reconstructed by excavating a trench and laying a course of the old brick on the bottom and filling the remaining space with gravel, using sawed ties and a T-rail. The road between rails and for twelve inches outside was paved with brick and grouted. Where curbing existed a cement gutter was placed; elsewhere a combined curb and gutter was constructed. Along the track the brick header, as laid by the car company, was one and one-half to two inches above the old pavement of brick. In a number of places the old pavement was lowered and raised in order to secure a good contour. The old surface was then cleaned thoroughly, much time being given to the cleaning of the brick. The amount of dirt which was taken from this surface was surprising. The brick was dried and especially prepared for the coating of asphalt.

The laying of the asphalt surface was witnessed by a number of citizens, who expressed themselves well pleased with the results. A good contour and pleasing grade was secured, and the appearance of the surface after completion was that of the other asphalt streets.

This street was cut into a number of times to make connections, besides the work done by the street railway company, and that of removing of the brick in the gutter, which sloped up to the curb, thus throwing the gutter about a foot away from the curbing, to be replaced with a cement gutter. A number of settlings in the old surface were noticeable, caused by trenches. This street receives considerable heavy traffic, besides a constant travel. The Barber Asphalt Paving Company gave its customary guarantee on this street.

It is possible to save the property owners, who now have brick or cobblestone streets, considerable in the coating of their street with a smooth surface of asphalt. It saves much of the cost of a new pavement and



OLD BRICK STREET, DECATUR, ILL.

PREPARING BRICK STREET FOR ASPHALT SURFACE, DECATUR, ILL.

LAYING ASPHALT SURFACE ON OLD BRICK STREET, DECATUR, ILL.

the results are good, giving a smooth, even surface where before was a rough, uneven and noisy thoroughfare.

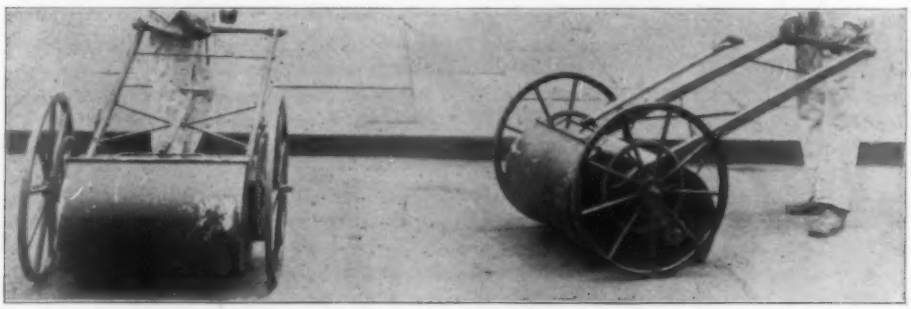
Decatur was one of the first cities to adopt brick as a paving material, and it is also one of the first to have her brick streets covered with asphalt. It is anticipated that many more brick surfaces will be covered, not alone in Decatur but in neighboring cities.

The photographs shown were taken during the actual work and show very well each stage of the process.

AUTOMATIC STREET SWEEPERS.

By Waldon Fawcett, Washington, D. C.

Two very ingenious devices, each capable of propulsion by one man, for use in cleaning city streets, have recently been invented by residents of the national capital. These two machines, although each is constructed on the same general principles as the ordinary carpet-sweepers with which every householder is familiar, constitute a very radical innovation in modern equipment for the cleaning of asphalt pavement. Each of the sweepers—and they have many points of similarity—can be used with a certain degree of satisfaction on other forms of pavement, but they are especially designed for employment upon asphalt, and it is possibly due to the very extensive use of this form of paving in Washington that the ideas for both forms of sweeper had inception in that city.



ATKINSON HAND PICK-UP SWEEPER.

The automatic sweepers are designed to displace the prevailing system whereby gangs of men with brooms, shovels and barrows are kept constantly busy on asphalt paved streets removing the refuse. It is claimed that one of the new machines of either style will do fully as much work as three men laboring with hand brooms, and that one of these mechanical workers will actually cleanse a pavement more thoroughly than is possible either by the utilization of the large sweepers drawn by horses or the employment of the hand sweepers equipped with heavy brooms.

The mechanical sweeper which has lately been placed in use on the asphalt streets of Washington, and with which experiments are now being conducted in New York city, Hartford, Conn., and Dayton, Ohio, shown in the accompanying photograph, is known as the Atkinson "Pick-Up" hand sweeper, and is manufactured by the Sanitary Street Sweeping Company, of Washington, D. C. It weighs about 125 pounds. The apron or hood which covers the brush is of galvanized iron, the handles are of wood, the supporting wheels of wood with iron tires, the axles of iron and the gear wheels of cast iron. The circular revolving broom or brush is 24 inches in width and 13 inches in diameter. At the front of the machine is another hood, similar in general contour to that which envelops the brush. The receptacle which is thus formed is known as the "dirt box," and into this the brush which revolves to the front sweeps the accumulation from the street. This dirt pan will hold fully half a bushel of refuse. For discharging the contents at the curb or elsewhere, it is only necessary for the operator of the machine to draw up a "pull," or

handle, which causes the "dirt box" to describe a semicircle, the motion emptying the contents.

In Washington the street cleaners discharge the contents of the "dirt box" once in each block. It is estimated that on an average the brush in a machine has to be renewed once every two months. These machines in actual service have demonstrated that they will pick up anything from fine particles of dust to a horseshoe or monkey-wrench. One of the great advantages claimed for them is found in the thoroughness of their work. After a street has been cleaned with these "pick-up" machines it is impossible for the strongest breeze to raise any appreciable amount of dust. Street cleaners follow along the curbs with "bag machines" gathering up the sweepings dumped at the line of the curb by the mechanical hand sweepers.

Another form of automatic street sweeper, invented some time ago by Mr. Jesse M. Harr, of Washington, has not as yet been placed on the market. This machine will probably be somewhat more expensive than the one previously described, but it combines to a great extent the operations of the street sweeper and the assistant detailed to gather up the sweepings. The brush is only partially enclosed, and suspended in front of it is a bucket, which corresponds to the "dirt box" of the other machine, and is open at the rear. Into this the revolving broom rolls the dirt. As soon as the bucket is full, a ratchet device on the large wheels which carry the sweeper pulls the bucket up a rope suspended from a frame-work overhead, and automatically dumps the contents into a large can which occupies a place on the rear of the machine. As soon as the dumping is completed, the bucket falls to the pavement again and a slotted guide-bar serves to throw it out some distance in front of the brush, where it rests until the brush reaches it and pushes in the dirt again. The sweeper is thus kept constantly in motion, and there is practically no loss of time save for emptying the large can, and this will not be found necessary oftener than two or three times a day.

In Washington it is customary for the operator of each sweeper to spray with a hand sprinkler a considerable area of pavement before commencing to sweep, but very often this is neglected, and, indeed, the sprinkling, which was instituted rather as a precautionary measure handed down from the days of sweeping by hand brooms, is superfluous, as, owing doubtless to the thoroughly enclosed brush, the manipulation of one of these machines on a street which has not been sprayed raises an inconsiderable amount of dust. It is customary for each operator of one of the automatic sweepers to repair at the close of each day's work to an ordinary street hydrant, and by lifting the hood of the "dirt box" enable the stream of water thoroughly to cleanse the interior of the machine.

MODERN FILTRATION.

By Robert E. Milligan, Chicago, Ill.

The modern mechanical filter in its highest development embodies three essentials: That is to say, coagulation, sedimentation and filtration. These depend one upon the other. By coagulation is meant the preparation of the water by introducing into it a harmless chemical which, reacting with the native carbonates of the water, results in the formation of an insoluble compound (hydrate). This hydrate causes the suspended impurities to coagulate and aggregate together, thereby assuming greater diameters and, increasing in specific gravity, readily subsiding. It is noteworthy that bacteria themselves are in suspension, and also that true coagulums absorb or destroy vegetable color in solution or fine suspension. The water after being properly prepared by coagulation flows or is pumped to the settling basin or basins wherein between 60 and 70 per cent. of the coagulated impurities are retained. These impurities are removed at will more or less frequently by simply flushing to the sewer. As settling basins are cheaper to install and necessitate the use of smaller percentages of wash water than is the case with filters proper, their value and position in the modern filter plant can be readily seen and appreciated. After leaving the settling basin, the partially purified water flows upon the filter bed proper; the arrangement is such as to insure the supply being taken from near the top of the settling basin by means of a floating suction or

FILTER HEAD-GAUGES AND TANKS, NORRISTOWN, PA.

CONNECTIONS FOR BATTERY OF FILTERS, PASSAIC, N. J.

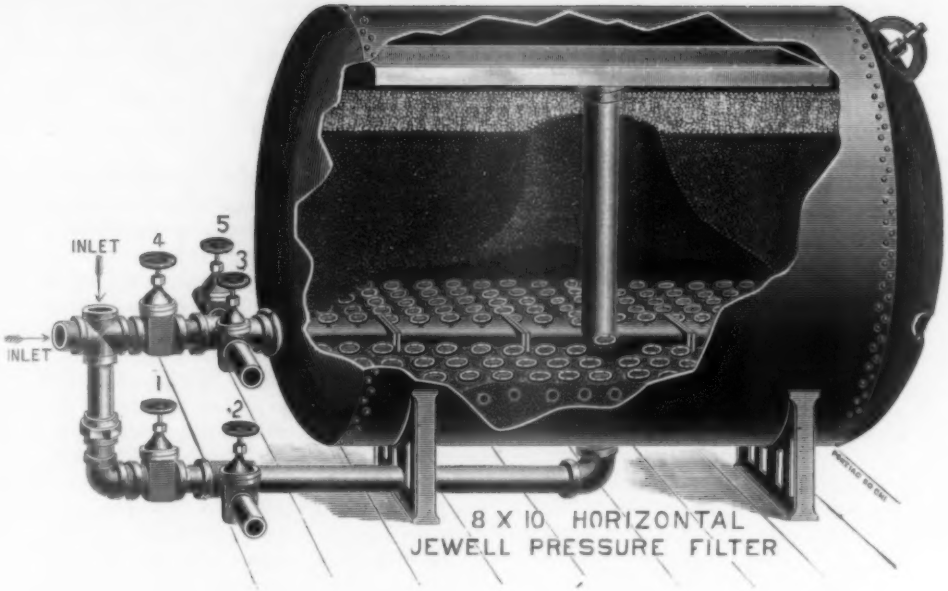
permanent weir. As the water flows to the filters, the stream is controlled by a float arrangement giving a constant head upon the filter bed. Passing downward through the sand layer, the water is divested of its impurities, is collected by a screen system beneath the filter bed, and, passing through the manifold pipes, is collected in the clear water well situated either beneath the filters or exterior to the filter house. The purified water is pumped from the clear well to the consumer.

The modern filter plant is not supposed to discriminate or differentiate between forms or families of bacterial contamination, but removes all in percentage degree and is interposed with equal confidence between the suspicious source of supply, or the source of supply known to be contaminated, and the consumer. The modern filter plant is a communal safeguard, and the results covering nearly every source of supply have vindicated its selection. From the above it can be appreciated that the form and number of the settling basins is a matter of adaptability to engineering conveniences and location so long as the principle involved be not violated. As a matter of practice, it is found that two hours' sedimentation is sufficient to remove 60 per cent. of the suspended matter where the water has been coagulated and where the source of supply is extremely heavy in silty matter; example, Ohio river. It is also true that the chemical used may vary, so long as it be capable of producing an insoluble compound in reaction with the native salts in the water and the by-product be innocuous. As a matter of fact, salts, either of aluminum or iron, are used, and the question is chiefly one of economy. Where sulphate of alumina is used, insoluble hydrate of aluminum is formed as a consequence of the reaction between the applied sulphate and the native alkalinity in the water, sulphate of lime being retained in solution.

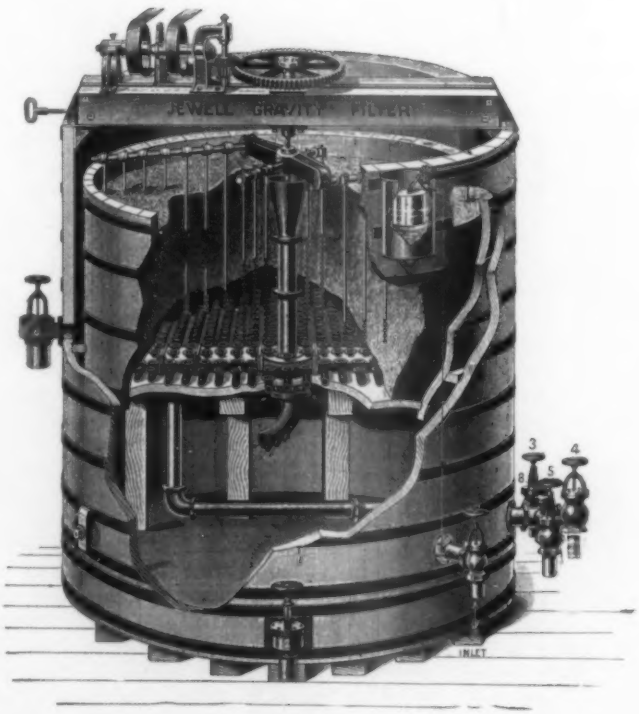
In the case of the iron process, sulphite of iron is introduced into the supply and subsequently destroyed by the application of lime water: insoluble iron (ferric) hydrate being formed, sulphite of lime is retained in solution and probably changes very slowly to the sulphate by the action of the dissolved oxygen in the water. It is true that neither alumina, iron nor lime can be detected by chemical test in the filtered water in excess of the amounts native in the raw water.

The mechanical filters may be divided into two general classes, viz., pressure and gravity. The pressure filter, while having performed good work, is subject to greater variation in results, is less responsive to control, and is gradually giving way to the gravity plant, except where the engineering conditions favor its erection and economy of first cost influences its installation.

Two things are required of the mechanical filter—that it deliver a certain number of gallons of clear, bright water, 97 per cent. free of bacteria, where 3,000 or more exist in the raw water, or if less than that, there shall not be more than an average of 100 bacteria per cubic centimeter in the filtered water; and that the filter be so constructed as to wash economically and perfectly by mechanical means. As has been shown, the first requirement is fulfilled through the coagulation of the applied water, the area of the sand layer, and the effective size of the sand grain. In this connection it may be said that a rate of flow, using a partially subsided water, equivalent to 1¾ gallons per square foot of area, is the best practice, the size of the sand being between 20 and 40 meshes to the linear inch. The perfect washing of the filter is of great importance, and naturally the greater the diameter the greater the test of the washing device. As filters are arranged in units, each unit furnishing its quota in gallons of purified water, independently, each filter is washed independently and with filtered water. The washing is accomplished by the use of an independent wash pump, taking its suction from the clear well. Where a filter bed exceeds 4 feet in diameter, there is a tendency on the part of the sand layer to part or crack open, because of the upward lift of the reverse current of water when washing. It therefore becomes necessary to assist the permeation of the bed by water with a device intended to separate the sand in every portion of the bed. For this purpose there are two general types of mechanical devices, that is to say, the rake bar system and the air wash. The former consists of descending bars or rakes permeating the sand bed about 3 inches apart, and these rakes are arranged to rotate through the sand during the washing period. The air wash assists the upward flow of wash water by perforating the sand bed equidistantly with air under pressure. A rotary blower is used to furnish the number of cubic feet of air required, and the strainer system is arranged



8 X 10 HORIZONTAL
JEWELL PRESSURE FILTER



to give equal distribution of air. In each case it requires a period of about 8 minutes to wash a 15-foot filter, which unit is capable of furnishing 500,000 gallons of satisfactory water after partial subsidence. In each case the filter bed is thoroughly cleansed, about 5 per cent. of the water pumped being utilized as wash water. As the reverse current of water passes upward through the sand, it carries with it the accumulated refuse matter previously deposited upon the sand during filtration, and overflows through a circular gutter and outlet to the sewer. The same gutter furnishes the subsided water to the filter during the filtering period. Filter plants are arranged so that each unit may be thrown out of commission separately and washed without destroying the continuity of the plant.

The filters and settling tanks are constructed of wood, steel or masonry, are commonly circular in form, though often rectangular, and are provided with inlet and outlet valves, battery connections, screens and manifold systems. The life of a well constructed cypress filter plant is probably at least 40 years if well looked after, and a 2,000,000 gallon plant, as commonly arranged, may be contained within a ground space of 40 by 80 feet. A rough estimate of cost may be said to be $9,000 per million gallons, up to 4,000,000 gallon plants, after which a decreasing ratio sets in.

Mr. J. N. Diven, secretary of the American Water-Works Association, in writing of the filter plant at Elmira, N. Y., makes the following statement: "My aim and accomplishment is to have always less than 100 bacteria per c. c. in the filtrate. This might be accomplished and still not show a high per cent. With me, highest percentage is always obtained with the worst water, even muddy water showing better results than clear containing about the same bacteria." This is strictly according to practice, and a good mechanical filter plant will fulfil this requirement.

At Lorain, Ohio, using sulphate of alumina as a coagulant, in 1897, between May 10 and 29 inclusive, the average number of bacteria per c. c. in the filtered water was 38, while the number of bacteria per c. c. in the supply from Lake Erie was 2,652. In 1901, using the iron coagulant for a like period, the number in the filtered water was 31, as against 3,254 in the lake. Occasionally as high as 200 bacteria may be observed in the filtered water when the amount in the source of supply is abnormal. It should be remembered that purification by filtration is limited in its application, and where the source of supply reaches a pollution beyond the province of the filter, sewage purification begins, one of the chief differences between a potable supply and sewage being dilution.

Outside of the benefit derived from filtration in a sanitary sense, mechanical filtration is in use in connection with water-works systems for the elimination of algæ, crenothrix and iron. Each year the removal of crenothrix from ground waters becomes of more importance, and it has been aptly termed the "pest of the water-works." While no specific disease is traceable to it when present in the supply, it is none the less a great detriment. It is noticeable that it exists and increases where the dissolved oxygen is insufficient and when iron is present in sufficient quantity to favor its growth. Carbonic acid and organic matter appear to be closely correlated with its development, and the degree of purification by filtration, where the elimination of crenothrix is desired, is generally expressed in percentage removal of iron, carbonic acid and organic matter. In this connection, aeration and the use of lime as a coagulant become a part of the filtration system. Crenothrix being a parasite is sensitive to the conditions that surround it, and in the presence of properly filtered water ceases to grow, dies and finally disappears. Waters containing large amounts of algæ growths require more area per rate of filtration than any other supply on account of the clogging effect they exert upon the filter bed, and filter plants constructed with a view of removing algæ should be arranged so that surface washing and back pressure can be readily obtained without actually washing the filter bed. The question of cost of operation has always received the greatest consideration, and any process reducing the annual expense is worthy of consideration. As a general statement it may be said that the cost of coagulation, using sulphate of alumina and averaging one grain to the gallon, which I believe to be a fair average on most western waters, taking into consideration the periods of clear water, is equivalent to $2.00 for each million gallons of water filtered.

The cost of the iron process upon the same basis would appear to be about $1.25 per million gallons, giving equal efficiency. In the case of the city of Lorain, a saving of $2,000 per year, or 66 per cent., is effected

by the installation of the iron process. On a 5 per cent. basis, this meant to the city of Lorain a saving of $40,000, for the cost of operation is a constant one and must be considered in the light of a perpetual investment.

SOME DETAILS OF SEWER CONSTRUCTION.

In the last annual volume of proceedings of the Brooklyn Engineers' Club will be found a paper upon "Practical Sewer Construction," by J. C. Meem, which contains some valuable descriptions of details of sewer construction. By the courtesy of the secretary of the club we are permitted to make some extracts from the paper and to use the illustrations necessary to give clearness to the descriptions. Reference is made directly to the plates as the clearest method of presenting the information.

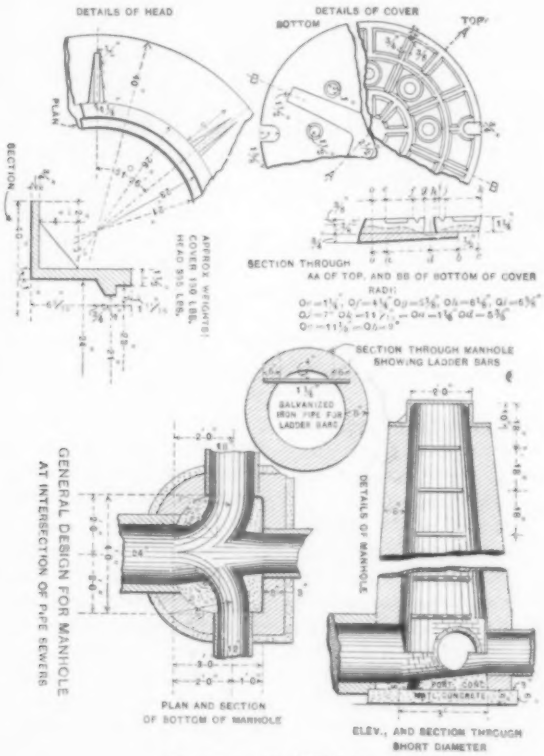

DETAILS OF HEAD
PLAN
SECTION
APPROX. WEIGHT OF COVER 310 LBS. HEAD 335 LBS.
DETAILS OF COVER
BOTTOM
TOP
SECTION THROUGH AA OF TOP, AND BB OF BOTTOM OF COVER
RADII
SECTION THROUGH MANHOLE SHOWING LADDER BARS
GALVANIZED IRON PIPE FOR LADDER BARS
GENERAL DESIGN FOR MANHOLE AT INTERSECTION OF PIPE SEWERS
DETAILS OF MANHOLE
PLAN AND SECTION OF BOTTOM OF MANHOLE
PORT. CONC.
CONCRETE
ELEV., AND SECTION THROUGH SHORT DIAMETER

PLATE I. MANHOLE.

Manholes. Plate I gives the usual form of manhole at a junction of lateral sewers. It will be noted that the sewer grade lines are assumed as the springing lines of the arches. These are the same as the center lines in circular sewers, but not in egg-shaped sewers. Unless the lateral sewer is the same size as the main sewer this gives the drop in the bottom needed to compensate for the curvature. The method of forming the bottom to include the drop is shown by the elevation. Details of the manhole head and cover used in Brooklyn are given, and of the iron rods used as a step or ladder in some cities. The manhole cover may be perforated for ventilation.

Plate II shows details of storm water inlets and catch basins. Many times, when fall in sewers is ample, the catch basin can be omitted and the discharge from inlet go directly into the sewer. The drawing shows a central catch basin with inlets from each of four street corners, the catch basin overflowing into the sewer at the manhole. "Many cities use an iron inlet head and cover, and put an inlet on the upper side of

each cross-walk, instead of at the corner, as shown here. Good results could doubtless be had where the flow converges at the corner by putting an inlet just above one walk, and giving the other gutter a slight fall to it around the corner. This inlet could have a steel-bound concrete cover (as shown in drawing), or an iron head and cover, or, in cases of heavy traffic, a granite head."

Plate III shows some standard sections of sewers. Figs. 1 and 7 are of standard egg-shaped sewers, single and double ring, the latter showing a vitrified brick wearing surface where the ordinary sewage flow runs, and the solid matters carried along by the sewage are most likely to rub the brick surface in sewers of good gradients. Fig. 3 shows a vitrified sewer pipe, and a half section of the concrete bed used in bad ground. Fig. 5 shows an egg-shaped section of kosmocrete sewer (cement pipe), with flat base for ease in laying. This pipe has hub and spigot, and was formerly much used in Brooklyn. It is considered to be not so smooth as vitrified clay pipe, and more readily affected by acids, but is easier to lay, and is cheaper. Fig. 8 shows a large two-ring brick sewer with rubble haunch walls or cradle.

Figs. 6 and 6A show sections of grillage foundation used when always entirely under water. Fig. 9 gives a view looking up stream of a three-way bellmouth or junction of three sewers, showing each of the sewers, a section of the arch including them all and the wall at the up-stream end. It will be seen that the three sewers here intersect at the springing line and their bottoms thus decline rapidly to the level of the bottom of the largest, at the down-stream end of the bellmouth where it enters the outlet sewer. A concrete foundation is shown. An I-beam roof or cover for the bellmouth may be used, as shown in Fig. 4, and the left of Fig. 2, with concrete or brick arches between the beams, thus giving a flat roof instead of an arch, as shown in Fig. 9 and the right of Fig. 2. Such construction permits of carrying pipes across the sewer, as shown in the left of Fig. 4, rather than deflecting them or passing them through the arch in case one is used. Plate IV shows a bellmouth in a five-foot sewer, ready for the arch. Plate V shows a bellmouth for dividing the discharge from a flat 4 feet 6 inches by 7 feet sewer between two wooden barrel sewers each 4 feet 6 inches in diameter. The design of the cutwater is an important part of the design of a bellmouth, especially where a large sewer is discharged into two smaller ones. It must be of such form as to prevent eddies, and in the latter case must not catch debris nor cause any floating objects to mount it high enough or with force enough to strike the brickwork above. It must also be of material strong enough to stand the shocks of floating objects and the wear of the gritty water and the heavier solids pushed along by the strength of the flow.

Plate VI gives two designs for wooden stave sewers which, in New York, are suspended from docks and carry the sewage from the outlet at the shore line out to the full tidal current, that it may be promptly carried away. Fig. 1 shows one with outlet on the bottom of the last section. Fig. 2 shows one with ordinary end outlet.

Plate VII shows the inside lower half of a double-barreled wooden stave sewer in the foreground and the outside of the barrel of the other line on the right. The drawings and views show the method of construction and the reason for dividing the sewer into two parts. The bellmouth shown in Plate V is at the shore end of these sewers.

Plate VIII shows various designs for centers, templates, forms, and sheeting. The process of laying a sewer and using these forms is thus described in Mr. Meem's paper:

"As soon as some 25 or 30 feet of the 'bottom' are ready for the sewer, heavy beams are thrown across the trench at every 20 or 25 feet, and the center line established on them. Elevations are then taken at these points, and the distances from these elevations to the sewer (or flow line) grade at these points calculated. Cleats are next nailed to these beams plumb to line, and notches are cut in each one at some regular foot or half foot above the grade. A cord is next stretched taut between the end pairs of these cleats, and profiles (Fig. 3) are set at each end of the 'bottom,' level and true to line and grade, with plumb and tape or grade pole, from the line above. After the work is started only one profile is needed, as the finished invert takes the place of the other. It is sometimes customary to 'short' grade in with a transit, by setting the instrument at one end of the trench and clamping the telescope parallel to the grade line. The target is then set on the rod, and the rod is moved up and down on each cleat until its bottom is at the required elevation.

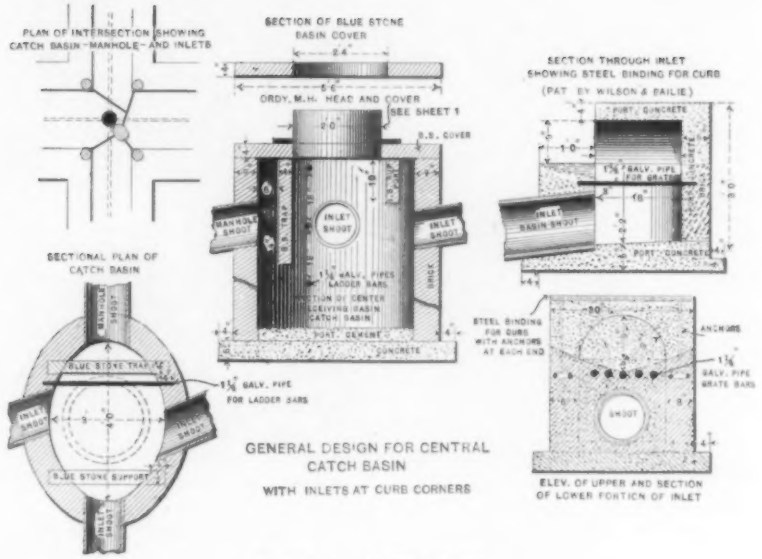

PLAN OF INTERSECTION SHOWING CATCH BASIN-MANHOLE-AND INLETS
SECTION OF BLUE STONE BASIN COVER
ORDY. M.H. HEAD AND COVER
SEE SHEET 1
SECTION THROUGH INLET SHOWING STEEL BINDING FOR CURB
(PAT. BY WILSON & BAILIE)
SECTIONAL PLAN OF CATCH BASIN
BLUE STONE TRAP
BLUE STONE SUPPORT
1⅛" GALV. PIPE FOR LADDER BARS
GENERAL DESIGN FOR CENTRAL CATCH BASIN
WITH INLETS AT CURB CORNERS
STEEL BINDING FOR CURB WITH ANCHORS AT EACH END
ANCHORS
GALV. PIPE GRATE BARS
ELEV. OF UPPER AND SECTION OF LOWER PORTION OF INLET

PLATE II. CATCHBASIN.

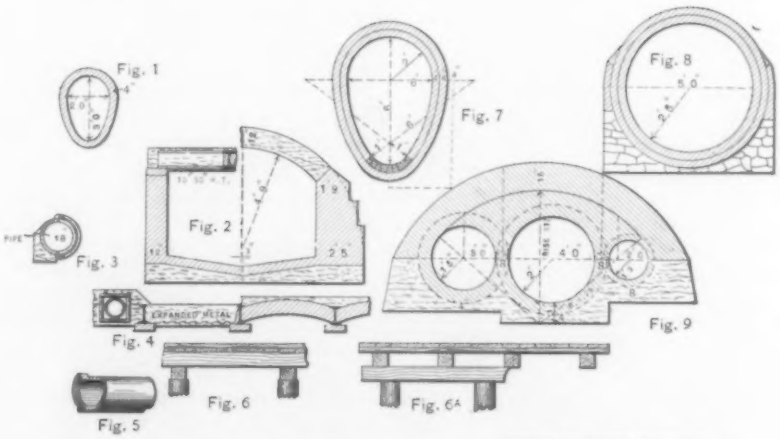


PLATE III. SEWER SECTIONS.

The author does not advocate this method in sewers of light gradient.

"The profile shown in Fig. 3 is a typical one for a 4-foot sewer with haunch walls. The profile, together with all templates, centers, etc., is usually furnished by the contractor from drawings or templates furnished by the engineer. The object of the profile is to give a true form for the outer and inner face of the sewer. Nails are put into the invert of this profile corresponding to the courses of brick, and one set for each ring. They are usually spaced from $2\frac{1}{2}$ to $2\frac{3}{4}$ inches apart, according to the joint required and thickness of the brick. A brick is usually 8 inches by $2\frac{1}{4}$ inches by $3\frac{5}{8}$ inches. A line is trigged by the mason from each nail to the brick course corresponding to it, and the course laid true to this line and grade. When two or more courses are laid, the outer courses are laid first, and precede the inner course a little. When haunch walls are not used, as the courses are built up, fine earth is worked in behind them to hold the brick in position until the mortar is set and to give them a good foundation afterward. The first three or four courses each side of the center are usually blocked, *i. e.*, built out flush to the profile; the succeeding courses are racked back. If on or at a curve the courses are toothed up to the profile. The courses are laid in rowlock, that is, on edge, in all except the heading course, which is laid flat and across the line of the sewer at the springing line. The joint across the end of the brick, that is, the $3\frac{5}{8}$ joint, is called the cross joint, the flat face is called the bed joint, and the edge is called the collar joint.

"As soon as the invert is sufficiently set the arch centers are set up. These centers are usually made 13 feet long with a rib (Fig. 1) at each end and two between. For ordinary work 3-inch by 1-inch lagging are nailed to these ribs for the arch to rest on. Two-inch by 9-inch planks are laid across the invert and from them the centers are blocked up to position. The arch is then turned, the courses being racked back, except on or at curves, where they are toothed. It gives better results on straight work, also, to tooth the last few courses near the key on each side; say, one course less than twice the diameter being a rule of thumb to govern this point.

"Spurs for house connections are built in just under the heading course, so as not to interfere with the setting of the centers. Manholes are laid out on the centers and the arch blocked up to it. The manhole is then built up from this opening, lines being drawn from the center to a target set to position and grade above, to work by. Steps or ladder bars are built in as the work progresses. The manhole and invert should be pointed up as soon as finished and the manhole and arch plastered outside with a good coat of mortar. The arch should be pointed as soon as the centers are struck.

"In building curves, the templates shown in Fig. 2 are used. The brick work being toothed at the point of curve, the profile is set to line and grade and coincident with the radial line of the curve. The middle template is then laid from the sewer to the profile and the middle course of brick laid true to this line and grade. The templates corresponding to the springing line are next laid in position, and as the work proceeds the hand profile (Fig. 6) is used to keep the perimeter of the sewer to its true position, by resting it from time to time on the middle and side templates, to test the work done.

"In building an arch on a curve the ribs are usually set in place at right angles to the tangent at that point, and these are held in place while the bottom strips of lagging are nailed on. These are then braced in position while the remaining lagging is placed. As this lagging approaches the key, 2-inch by 1-inch stuff should replace the 3-inch by 1-inch, and finally 1-inch by 1-inch stuff (sawed on one side to make it bend to the proper curve) should be used. If the ribs are first nailed to 6-inch by 2-inch templates cut to fit the inside walls of the sewer (the matrices of the side-wall templates will do for this) this center may be drawn forward and used over again.

"In tunnel work it is customary to use the ordinary centering with lagging up to some 12 inches either side of the key, when lateral notched lagging with its upper and outer face curved to the intrados of the arch is used. This enables the mason to place the lagging as he brings forward the last courses of brick work. A special design in centering is shown in Fig. 5. In this the middle rib is made double width, and half-length lagging is used as the work approaches the key. In bellmouths or junction chambers templates are used for the curves of the springing line, and the work shaped up by the masons with hand profiles. Special centers, of course, have to be made for them and for other special work."

Plate IX shows the system used in driving

PLATE IV. BELLMOUTH READY FOR ARCH, NEW YORK CITY.

PLATE V. BELLMOUTH FOR DOUBLE-BARRELLED OUTLET UNDER CONSTRUCTION, NEW YORK CITY.

the tunnel of the Canal street sewer at Chatham square. The drawings are self-explanatory. "The continuous lagging was driven ahead with jacks and bars as shown; supporting them in front temporarily with a cantilever beam, using a curtain of canvas, rolling it down back of horizontal sheathing as the excavation progressed; supporting the lagging again on a beam resting on pillars built up from the invert and backfilling underneath a trail piece in the lagging as it was driven ahead." Plate X is a photograph of the work in progress, showing the cantilever, together with the cantilever beam and the regular and cantilever bracing and the horizontal sheathing over on the canvas. Plate XI shows the meeting of two headings in the tunnel. The lagging from the east is seen to extend on the lagging from the west, whose beveled ends are shown.

EDITORIAL COMMENT.

J. B. Johnson.

The engineering student and the practicing engineer of the present day have sustained a serious loss by the accidental death of Professor J. B. Johnson, which was noted in closing the forms of our July number. The writer has known Mr. Johnson since his school days and has had many opportunities to observe his devotion to his chosen work, his performance of his selected tasks for their own sake and their benefit to others, his lack of thought regarding his own reward. His turn of mind was eminently practical, and, while nearly all his life was spent in teaching and in the consideration of theory rather than its application to practice, his books show that he was thoroughly in touch with that side, and his former students report that his teaching was almost equally well calculated to enable them to make application of their attainments directly to the practical solution of the problems arising in their practice.

His books were written upon subjects of direct practical interest, in which there was a dearth of modern literature, and are popular because they fill their place so well. He drew upon his personal experience for much of the book upon "Surveying," and for a good share of that upon "Materials of Construction," and was fortunate in his willingness to call upon experts in other special lines to write chapters upon them. The "Modern Framed Structures" was published with three authors in its outer title. "Engineering Contracts and Specifications" is another book which finds many users. The need for the books and their fitness caused the sales to be large, for technical books, and the author took the opportunity of each new edition to change and to add, so that all his books were always fully up to date in both data and theory. This continued them in the favor of engineers, and proved to be a good plan from the financial as well as the technical point of view.

The index of technical publications begun by Mr. Johnson in the Journal of the Association of Engineering Societies, and carried on for several years by others under his direction, was one of the valuable results of his desire to share the results of his labors with others. While the index has been much extended in some lines since he relinquished its control, it has never had the same quality nor, to the writer at least, the same value.

One of the methods in which Mr. Johnson made himself most useful in a directly personal way was in the formation and management of societies. Whether in a national or a local engineering society, an educational or a scientific association, a Sunday-school or a church conference, he was always ready to help, and usually had some new thought or combination to offer which had a direct beneficial effect upon the meeting or the organization.

His work in technical education was nearly all done at Washington University, under many restrictions on account of lack of funds. The short period spent at the University of Wisconsin, and the results obtained, gave some indication of what he could have done if given time to work out his ideas. The position at Madison was ideal, in that there were corps of devoted instructors in the various technical departments, working to the best advantage possible in their respective lines, ready and anxious for a head who could unify the work and serve as a central force guiding the vessel, in which each was doing his share of the work of propulsion. Any well-balanced man could make a qualified success in the position, but Mr. Johnson had many of the qualities which warrant the

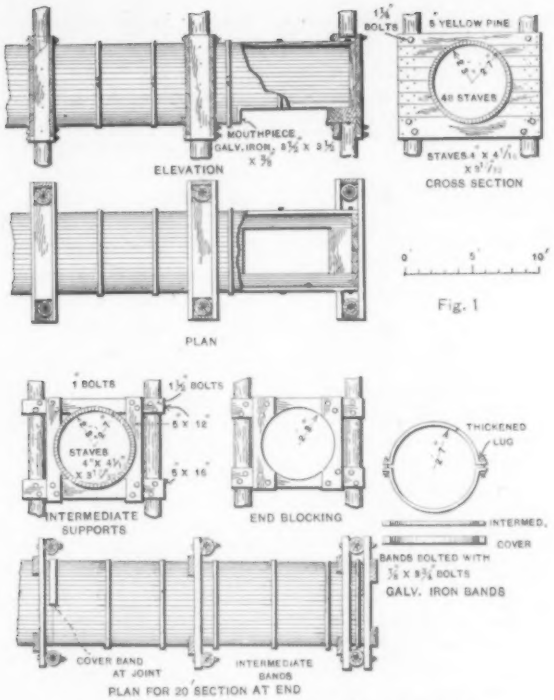


PLATE VI. WOODEN STAVE SEWER DETAILS.

PLATE VII. DOUBLE-BARRELLED WOODEN SEWER UNDER PIER, NEW YORK CITY.

prediction that his administration in a comparatively few years would have placed his department of the university abreast of the greatest technical schools of the world.

Wet or Dry Concrete.

Some data from new experiments upon the mixture of concrete were reported at a recent meeting of the Western Society of Engineers by H. W. Parkhurst, whose paper appears in the last number of the Journal of the Society.

Mr. Parkhurst was not entirely satisfied with the inferences drawn from the results of some experiments on wet and dry mixtures reported in the Society's Journal for December, 1900, and made some experiments to obtain further data.

He made his concrete with one barrel of cement as a unit, measuring 4.42 cubic feet when dumped loosely into a box. The proportions used were 1 cement, 2 sand, $2\frac{1}{2}$ gravel and $2\frac{1}{2}$ broken stone. Three blocks were made, one using 5.1 per cent. of water by volume, one 9.5 per cent. and one 7.5 per cent. The first made a dry concrete, "mealy," and no amount of ramming brought water to the surface. The second made a wet concrete which quaked easily and on which the men could not stand to ram it. The third made a medium wet concrete, in which there was no quaking, but water flushed to the surface of each layer as it was rammed; the mass was always hard and there was water enough on top to spatter when the tamping was finished.

When ten months old the blocks were broken by drilling and wedging with plug and feather. The texture of the dry concrete block was poor, the surface being easily abraded. That of the other two was excellent. The weight per cubic foot of the medium block was about 1 per cent. greater than that of the wet block. The medium block could be and was rammed into a more compact mass.

Mr. Parkhurst concludes from his experiments that a medium concrete which "shall not quake in the barrow nor while handling, but may quake when heavily rammed" is best, and that it is probably safer to have an excess than a deficiency of water. It is of the utmost importance that the concrete be thoroughly consolidated by ramming.

Much of the difference in opinion of engineers and cement workers depends upon the understanding of the terms wet and dry as applied to concrete. A paving contractor in putting down his concrete foundation is likely to use all the water he can get on his board, that it may be as easy as possible to cause "every stone to be covered with mortar." When required by the inspector to reduce the amount of water to what Mr. Parkhurst calls medium or even wet, he complains that dry concrete is not so good as wet concrete, and claims that he is required to make it too dry. Unless the inspector knows, and has the courage of his convictions, the contractor is likely to carry his point. With concrete of less than 10 per cent. water defined as wet concrete, the inspector can measure the water for a batch or two, and have authority for his reduction in the amount. On ordinary foundation work, especially of streets, the question is not one of wet and dry concrete, but of wet and more wet. There are necessary variations in the amount of water with the kind and condition of materials, but if the inspector will contend that 10 per cent. of water makes a wet concrete under any circumstances, he will often find it difficult to enforce unless he has a positive engineer or council committee behind him. The definition is a good one to follow, and the more water he can shut out, down to the 7.5 per cent. of the medium concrete, the better he will make the concrete. The more the contractor will complain, however, for the more thoroughly he will be required to mix the concrete, the more he must ram it to comply with a proper specification, the more time and labor it will take.

Free Municipal Services.

The city of Boston purchased the East Boston ferry in 1870 for $275,000, and it has been operated by the city ever since. The argument for its purchase was based upon the benefit to the city at large on account of the expected development of East Boston. A similar argument caused the council in 1887 to adopt the present schedule of ferry charges, which is half that of former years. Foot passengers pay one cent, and a one-horse carriage with three passengers, by purchasing packages of tickets, can cross for $2\frac{1}{2}$ cents. The same argument has been advanced for abolishing ferry charges altogether. That the argument is fallacious is shown by the fact that there has been no greater increase in receipts from taxes in East Boston than in any other part of the city. Thus the percentage of East Boston receipts for taxes to the entire tax receipts

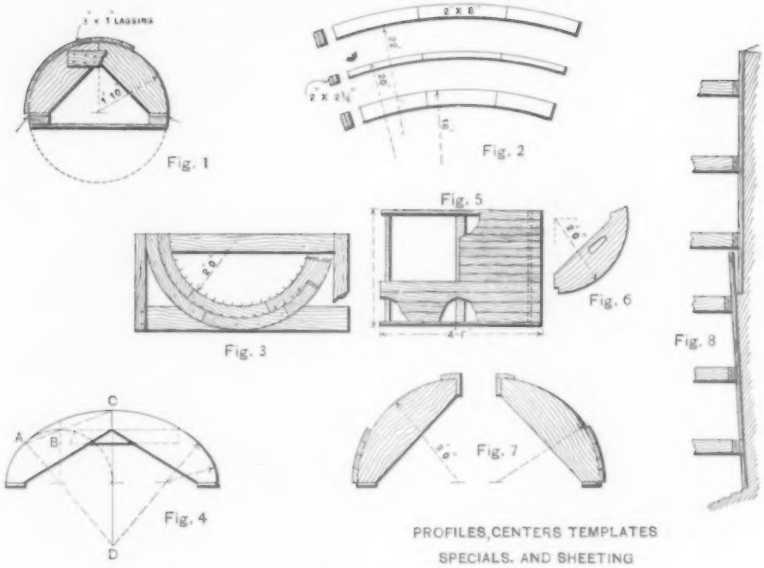


PLATE VIII. SEWER-FORMING APPLIANCES.

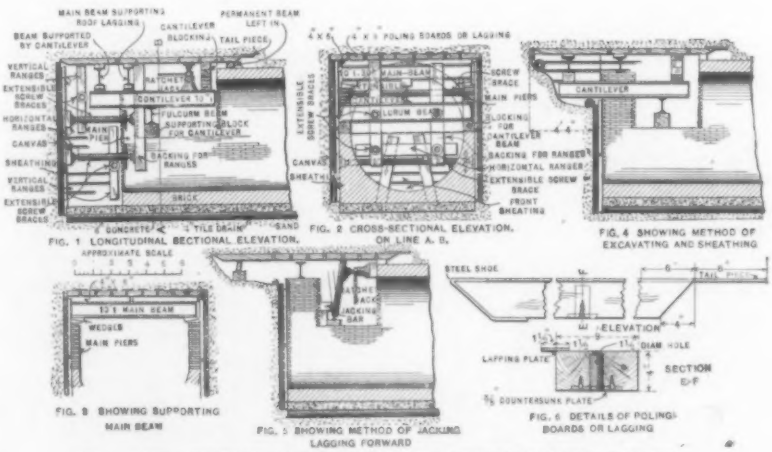


PLATE IX. DETAILS OF SEWER CONSTRUCTION IN TUNNEL.

of the city in each year from 1892 has varied from 2.27 per cent. in 1899 to 2.50 in 1892. It is evident, therefore, that the ferries have been supported for the benefit of East Boston at the expense of the city at large. It is computed that it takes 95 per cent. of the taxes received from East Boston to pay for the support of the ferries, and that the receipts only replace 52 per cent. The average deficit, including charges for interest and depreciation, is about $150,000 a year. The completion of the tunnel to East Boston will change conditions materially, whether to the advantage or disadvantage of the ferry does not yet appear. It is now proposed to revise the ferry rates so that they will at least pay the operating expenses.

A California city official is making a similar argument for furnishing free water to the inhabitants of his city. There is no opportunity in such case to compare sections of the city, and comparison with other cities contains too many elements foreign to the question to make it valuable. It may be suggested, however, that his argument of economy is not based on fact. It may be true that the absence of collectors will make a saving of ten per cent. in the cost of operation, but there remains for consideration the further fact that the expansion in the service induced by the fact that the water is free, and the increase in waste on account of the character of most of the new users, will be so great that the expenses of operation and the charges for new extensions will be vastly increased, and the taxes will be increased in corresponding amount. It will follow that the city will call those who do not own property, those who can use the water to advantage without large investments in taxable property, and will repel investors in such property. The financial difficulties into which the city government will fall can readily be imagined.

Another error of the writer referred to is found in his comparison of the case with that of free public use of sewers. It is very common for small cities especially to require the water-works to pay all the expenses of construction and operation out of the revenues, including even the public uses of water for fire, public buildings, fountains, parks, etc. Our writer sees the injustice of this and immediately jumps to the conclusion that the water should be as free as the sewers. A little study would show that there are three elements in the case: one, the benefit to the property on account of the presence of the water supply, which should be met by a direct tax upon the property so benefited; the second, the benefit to the city at large, which should be met by a general tax; and the third, the benefit to the user of water, which, after a certain minimum amount of water has been used, is practically proportional to the amount of water used.

The injustice lies, not in the charge for water in proportion to the use made of it, but in including in this charge the benefits to the public at large and to private property, in which the water user has no individual interest. The two benefits mentioned are similar to that of sewers, and should be met by similar charges upon the general taxes and upon property benefited. The benefit to the individual user is not in the same class and must be considered as an entirely independent matter.

There is a similar case in a public lighting plant. The lighting of the city streets should be a city charge, paid from the funds raised by general taxation; there is an element of direct benefit to adjacent property which may be, and sometimes is, taken into account by assessing cost of lines, mains or lamps on the adjoining lots; but surely no one would contend that the city should furnish light for all private users in the city without charging in proportion to the use made of the light. The benefit of the light, as well as the benefit of the water actually used, is proportional to the amount used, not to the amount of taxable property the user owns. The state of Illinois recognizes this difference between public and private use in the case of light, by permitting cities to own and operate their own street lighting plants, and prohibiting them from engaging in commercial lighting. Except for sanitary reasons and on account of the earlier appearance of municipal water plants, the same separation might be made in the supply of water.

Engineering at St. Louis Exposition.

The chief of the department of Liberal Arts of the World's Fair at St. Louis in 1904 is Mr. J. A. Ockerson, a civil engineer of high standing. He naturally takes a special interest in securing a full exhibit of the work done by the engineering profession, and is preparing for the proper display of all exhibits of value which may be sent. The engineer is ordinarily an employe and the results of his labor are in a sense not his own, but most engineers can personally fur-

PLATE X. SEWER CONSTRUCTION IN TUNNEL, NEW YORK CITY.

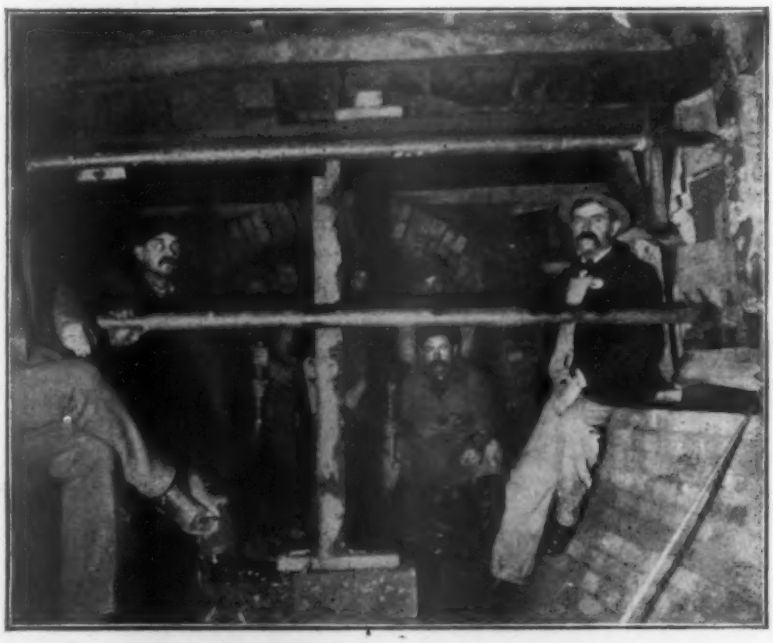


PLATE XI MEETING OF SEWER TUNNEL HEADINGS, NEW YORK CITY.

nish something which will be interesting and novel as an exhibit. It will also be possible to interest the managers of work in which they are engaged in the making of such exhibits, which may then be more elaborate. Some cities could supply exhibits under the direction of their engineers which would be of value to them. The "model city" which is to be a feature of the exposition can be approached in many details by our cities and the demonstration of this fact will redound to their credit and advantage. This is a suggestion that our readers exercise their inventive and artistic powers in devising methods of exhibiting the valuable and important work of which they have or have had charge, and that they forward the results of their effort for exhibition at St. Louis. Mr. Ockerson will supply all the needed details regarding space, shipping directions, etc.

THE QUESTION DEPARTMENT.

TESTING OF CEMENT.

In the February number for 1902 of your magazine, page 111, is made the statement that in the public works of the District of Columbia for the year 1901, 7,498 barrels of natural cement and 5,018 barrels of Portland cement were rejected on said works. It would be highly interesting and instructive to engineers to know the reasons for these rejections. It may have been on account of deteriorated or weathered condition of the cement, or it may have been on account of the cement itself, being in the manufacturing of the same. Anyway, the rejection of 12,516 barrels of cement in 12 months, unless an enormous amount was used, would certainly show a high percentage of defective cement, and would show the necessity of the most rigid kind of inspection in the use of cement. The requirements of the specifications must have been very close. In ordinary city work, especially of the smaller cities, the rejection of a barrel of cement is almost a *casus belli*, and some inspectors prefer to see a "spoiled" barrel go in rather than make the fight to keep it out. How many barrels of the 5,018 were imported is not stated, and thus an estimate of the comparative merits of the domestic and foreign Portlands can not be made in this given case, which comparison would be of interest to engineers. On sewer construction and concrete foundation for streets, a cheap cement is generally used, sometimes of unknown brand, the inspection being lax, and the result is a poor and indifferent job. The rejection of so large a number of barrels by a competent authority, well equipped for thorough testing, is pretty good evidence that the market is full of inferior cements, and the closest inspection in a given work is required to obtain good results. Without faith in the maker and in the brands used, an engineer would be compelled to devote considerable time to making tests and weeding out the poor and defective cements. Few engineers have the appliances for making the proper tests, and are compelled to use cements untested and to rely almost wholly on the manufacturer for a good product. This he is disposed to do, and after having tried certain brands and found them as recommended, he will be slow to make a change to others he knows little of, although possibly a better cement can readily be had.

W. F. Mann, Kokomo, Ind.

From the report of the engineer commissioner of the District of Columbia for the year ending June 30, 1901, from which the figures above quoted were taken, we learn that eight brands of natural hydraulic cement, manufactured in Maryland, West Virginia and Pennsylvania, were tested. From 53,101 barrels, 5,315 samples were taken, or one sample for each 10 barrels, and on the results of these analyses, 7,498 barrels were rejected as not complying with the specifications. A single defective sample thus rejected about 10 barrels of cement. Fourteen per cent. of the cement offered was rejected. Five brands of American Portland cements, manufactured in Pennsylvania and New Jersey, were tested. From 66,118 barrels, 6,610 samples were taken, and on the results of these analyses, 5,018 barrels were rejected, or 7½ per cent. The quality of the cement used is very good, if it may be judged by the average results of the tests which are reproduced from the report, omitting only the names of the brands. No tests of foreign cements are reported. The brands of rejected cements are also not reported. Each line gives the data for a different brand of cement.

Natural cements.

Number of barrels	Number of samples	Per cent. residue, 100 mesh sieve	Initial set, minutes	Per cent water used: Neat cement	Per cent water used: 2 parts sand	Temperature of air and water °F.	Tensile strength: Neat cement, 1 day	Tensile strength: Neat cement, 7 days	Tensile strength: 2 parts sand, 7 days
5,297	529	18	12	30 3	14 4	72	154 9	216 3	152
3,114	311	16 7	14	31 6	14 5	72	155	256 2	161 5
18,787	1,878	18	19	30 7	14 3	72	101	168	81 6
19 149	1,914	15 6	19	32 8	14	72	89 3	147	85 5
4,114	411	18 6	16	30	14	72	113	195	121
130	13	9	49	31	14	72	87	166	107
1,591	159	10	60	25	12	72	146	217	120
919	100	9	15	29	13	74	109	189 3	109 3

Portland cements.

Number of barrels	Number of samples	Per cent residue, 100 mesh sieve	Initial set	Per cent water used: Neat cement	Per cent water used: 3 parts sand	Temperature of air and water	Tensile strength: Neat cement, 1 day	Tensile strength: Neat cement, 7 days	Tensile strength: 3 parts sand, 7 days
11,208	1,120	7 5	h m 2 33	18	8 6	72	353 4	816 1	300
17,260	1,726	8	3 40	18 5	9	73	382 9	827 5	319 4
8,935	893	8	3 00	19	8	72	355 5	731	287 5
7,109	710	11	2 00	20	8 7	68	468 5	940 3	351
27,115	2,711	7 8	2 30	20	9	70	394 5	889 5	330

The inspection in Washington, or perhaps

it would be nearer the truth to say the rejection of cement not quite reaching the requirements, is probably more rigid than in any other municipality, and the number of samples taken is greater than in any city with two or three exceptions—another reason for the greater percentage of rejections. Where a single sample represents many barrels, re-sampling is demanded and acceptance very frequently follows the second test, but when a sample rejects but 10 barrels the demand for re-test can be successfully resisted, especially under the conditions in Washington.

In the smaller cities far too little attention is paid to cement inspection. Where large quantities of cement are used, and the cement is purchased and furnished to the contractor by the city, as in Washington, it is possible to keep enough cement on hand to permit the full set of tests reported in the tables, but where the cement for a single job is purchased by the contractor, and every effort is made to get the work completed as soon as possible, this can not be done. Short time tests must therefore be depended upon.

A very satisfactory method for these conditions is followed by some cities, which is approximately stated as follows: Under the specifications for cements are listed a number of cements which have successfully passed the tests, sufficient time having been taken to determine the qualities of the cement and whether it is uniform. Evidence from completed work of sufficient age to prove the cement thoroughly, may also be demanded. Cements in this list are accepted, subject to the short time tests, which simply test the uniformity of the cement and its general compliance with the specifications. Frequent variations from uniformity in quality are sufficient under the specifications to reject all cement of that brand, no matter what its previous record may have been. New cements may be added to the list if they are furnished in time to permit the full set of specified tests. When the specification is first adopted, the list of cements will be restricted to those whose qualities, especially as to uniformity, are already known, but it will be extended from year to year, as new cements are offered. The main dependence is placed upon the known reputation of the cement, but this is controlled by the demand for uniformity, and damaged shipments, which can not be rejected by simple inspection, can also be cut out. The market is open to any cement, by conforming with the very reasonable requirement that the cement be furnished in time to permit the necessary tests given in the specifications. The consequences of the occasional attempts of dealers and contractors to deceive by reshipping rejected cement, mixing cements, and substituting cheaper cements under listed brands, can be thrown on the cement manufacturers under this specification if thought desirable.

It is beyond question true that cement not coming up to the standard is frequently shipped to the cities in which inspection is loose or entirely lacking, and every attempt to introduce a system of tests will result in contests until the fact that tests are required becomes generally known in the trade, when cement which is certain to pass the tests will be much easier to obtain. One fruitful cause of contests over rejected cement is the sporadic nature of the attempts at inspection and test in the small cities and the strong probability that a contest will induce the council to overrule the decision of the engineer. If he can secure the backing of the council in the adoption of and adherence to specifications containing such provisions as those noted, and gives due notice that they will be adhered to strictly, the usual plea of absolute loss of the rejected cement or of loss of the freight charges can be overruled on the ground that the contractor was previously informed and should have purchased his cement subject to inspection or that he took his chances and must pay the penalty of his attempt to use inferior materials.

It is possible that, until the fixed purpose of the city to require the specified materials is fully understood, the percentage of cement rejected would be even greater than in Washington, but under ordinary city conditions, the brands to be used being restricted to those which have proved themselves worthy, the percentage of poor material offered would soon be reduced to a much lower percentage.

No cement without a brand should be permitted within sight of the work, and the contents of defaced packages should be carefully examined for substitutions. The general appearance of the cement in a package will usually show to a well informed inspector whether it is a substitution or not. The Indianapolis specifications for cement for sidewalks are prepared upon

the principles outlined above. They are given in the "Directory of American Cement Industries and Hand-Book for Cement Users."

NO PATENT ON CEMENT SIDEWALKS.

Can you tell me if there are patents on the Portland cement sidewalks where you put in a foundation of cinders, three inches of crushed stone and cement, with a finish of one and one-half inches of cement, beach sand and fine crushed stone? Are there patents on cement chimney tops?

——, *Newburyport, Mass.*

There are said to be some patents on special combinations of materials, smelter slag, for example, but the materials mentioned in the question are in such common use and in so near the combination described that there can scarcely be a valid patent covering their use. None such are known in this office. If there are any such patents they are infringed every day in all parts of the country. The same statement would apply to the chimney tops. Certain reinforcements of concrete are patented, and possibly certain designs, but numerous forms are made and used which are not infringements of any patent.

CURVES IN CEMENT PAVEMENT—MOLDS FOR ARTIFICIAL STONE.

1. What is the best plan for making curves in cement pavement? I have used light lumber for large curves and brick set on end for shorter turns.

2. What is the best plan of securing frames together for artificial stone?

E. Kenney, Creston, Iowa.

1. Light lumber can be used for all curves. When the curve has such a short radius that the plank will not bend to it, a number of parallel saw cuts can be made across the plank on the inside, running them deep enough and wide enough or numerous enough to give the desired curve. If the sawing is neatly done and the edges are smoothed, quite a smooth surface can be made. If very smooth surface is needed, a metal sheet can be put against the timber form and the cement laid against this.

2. Will our readers give their answers to this question? One method which suggests itself is the use of two forms, besides the bed, each for two sides of the stone. They may be hinged together at one corner of the form and fastened at the opposite corner by bolts with nuts, the bolts on one form swinging into slots on the other, so that only one or two turns of the nuts are necessary to tighten the form. The same method of fastening can be used in place of the hinges, also, if desired. For large stones the forms must be heavy enough to hold their shape, and may well be of cast iron or other strong metal, especially since wooden forms swell and warp so as to lose their shape. See, also, a description of some cheap forms in the department of "Current Information" in this number.

BOOKS ON CONCRETE, GRADING, STREET PAVING AND LAYING WATER PIPE.

Where can I buy books on concrete work, grading, street paving and laying water pipe, etc.?

J. W. Cook, Fort Worth, Tex.

MUNICIPAL ENGINEERING COMPANY can supply the books desired at the publishers' prices. The subjects named are well treated in Tillson's "Street Pavements and Paving Materials" ($4) or Byrne's "Highway Construction" ($5); Goodell's "Water-Works for Small Cities and Towns" ($2), or Folwell's "Water Supply Engineering" ($4): and "The Directory of American Cement Industries and Hand-book for Cement Users" ($5).

CONCRETE STREETS AND FOUNDATIONS—INSTRUMENT REPAIRS—ELEVATION OF CURBS—CAPACITY OF SEWERS—METHODS OF TESTING BRICK.

1. Have you any knowledge of cement blocks for paving streets, regarding their strength and durability?

2. What is a good book treating of cement mixing and use for paving, bridge foundations, building, etc.?

3. Can you refer me to a good instrument-repairing shop?

4. Can there be much difference between the elevations of the two curb grades and the center crown grade of a street?

5. Where can I find rules showing amount of flow through different sizes of pipes on different grades, pipes say from 10 inches up to 2 feet in diameter?

6. What is the best way to test brick for paving purposes, if one does not have a machine?

M. J. D., Kane, Pa.

1. Concrete blocks have not yet been used on streets, unless in a small way as a test. Streets have been made of concrete in Bellefontaine, Ohio, and New Orleans, La. In the former city they have been in use for ten years or more, and are reported as wearing well, though quite slippery. In the latter city they were laid a year or more since on a part of a very wide street which has but little traffic. It seems probable that well-made blocks of good material would be strong and durable, but that they would wear so smooth as to make the pavement objectionable on account of slipperiness. If this objection can be removed, the concrete blocks may become popular for street pavements.

2. The "Directory of American Cement Industries and Hand-book for Cement

Users" ($5) contains specifications for all kinds of cement and concrete work, including the streets above named, the kinds of work mentioned in the question and many others.

3. The firms whose names are found in the business directory in our advertising columns will doubtless repair instruments. They are reliable and do good work. See the heading "Surveying Instruments."

4. There are regular forms for street surfaces. Those devised by Mr. A. Rosewater are given in MUNICIPAL ENGINEERING on page 169, March, 1897, and 243, May, 1898. Mr. E. L. Andrews prepared a diagram from the formula, which is given on page 241, April, 1899. A valuable article on "Street Grades and Cross Sections," by R. P. Woods, will be found on page 190, October, 1899. The location of the crown of the street in case one gutter or curb must be much lower than the other is also discussed. Unless quite impossible, the lower gutter should not be more than three per cent. of the width of the pavement below the upper gutter, and the crown in that case will be located in or near the upper gutter. An article on "How Street Intersections Should be Planned," in case there are differences in elevation of the curbs, will be found on page 167, March, 1900. A formula for cross-section of brick and stone streets and crown of streets for the various grades is given on page 206, April, 1898.

5. Tables and diagrams for finding the discharge of sewers of the sizes named will be found in the standard books on sewerage, such as Staley and Pierson's "Separate System of Sewerage" ($3), Folwell's "Sewerage" ($3), Moore's "Sanitary Engineering." Colby's "Slide-rule for Sewer Computations" ($10) will be found most convenient and accurate, and adapted to all ordinary sizes of sewers.

6. Practically the only way of testing brick on the street is with eye and hammer. In selecting the make of brick to be used, the rattler and absorption tests, with others if found desirable, may be used, if the evidence of successful use in streets under similar traffic is not sufficient and there is no evidence of failure. But the acceptance or rejection of individual bricks on the street must be made by inspection of the outside, and of the inside also, by breaking in half with a hammer, in case of doubt. The requirement of regular test should be in the specifications, however, to fall back upon in case there is a contest over the inspector's decisions. Experience and good judgment in comparison of the brick as delivered, with the samples filed with the bid, and tested, are what makes an inspector valuable.

SUBSTITUTION OF TAR FOR ASPHALT.

I wish to know how tar could be substituted in part or wholly for asphalt. The substitution may make a poor mixture, I understand, but still I wish to find what proportions are adopted and the methods used. *Clinton R. Stewart,*
Johnstown, Pa.

Some of the earliest bituminous pavements laid in this country were laid with tar as the cementing material, and many of the earlier asphalt pavements were laid with a mixture of tar and asphalt. Some of these were quite successful, while others were more or less complete failures. These were sometimes due to insufficient foundations.

The objection to the use of tar alone in the proportions used for asphalt pavements is the greater variation in softness with change in temperature. Thus, a pavement laid for use in cold weather would be too soft for the warmest weather of summer. Judicious mixtures of asphalt and tar might overcome most of this objection.

However, all kinds of tar are not suited for use in pavements. Nearly all gas is now made by processes which destroy the value of tar for paving purposes. There are very few works now using the old processes, which left in the tar the permanent asphalt-like portions which gave the tar life and value in all variations of street temperatures.

The latest development in street surfaces is bituminous macadam, which, instead of using a large proportion of bituminous materials to hold small grains of sand in position on the street surface, uses larger aggregate mainly in the form of stone and as little bituminous material as possible, merely enough to fill the voids in the stone, which are made as small as possible by properly proportioning the stone as to size of pieces. The bituminous material simply serves as a cement to hold the stones in place to receive the wear and keep moisture out of the lower layers. Tar is largely used in the bituminous cement for these pavements, but this tar must be of the best quality, not that remaining from the modern processes of making gas, and must be refined to the proper consistency.

The use of tar with asphalt in asphalt pavements achieved so bad a reputation from the early failures that its further use

has been prohibited by specifications generally and has not been followed unless surreptitiously. The small amount of good tar obtainable has also prevented further experiments on the more scientific basis of later paving construction, so that there is now nothing authoritative upon the subject of mixing the two materials for paving. That successful mixtures can be made, if good materials are used, is reasonably certain. How to make them is the question that is undetermined.

COST AND DURABILITY OF ASPHALT PAVEMENTS.

Our city is conducting an investigation of various forms of pavement with a view to adopting a new policy in the city, and I have been asked to look into parts of it. If you can favor me with references to any articles or information concerning the durability, cost and wearing qualities of asphalt pavement it will be much appreciated.

———, *Madison, Wis.*

The volumes of MUNICIPAL ENGINEERING are the best source of information and argument upon this question. Some of the more important articles on the subject are the following:

"Maintenance of Asphalt Pavements," vol. XXIII, p. 10; "Asphalt Paving Under Municipal Management," XXII, 144, 150, 176 and 384; "Kinds of Asphalt in Use," XXI, 249; "Natural and Artificial Mixtures for Asphalt Pavements," XXI, 330; "Asphalt Paving Specifications," XXI, 248; "Comparison of Cost of Asphalt Pavements Under the Specifications of Various Cities," XX, 132, 146; "The Block Asphalt Pavements of Pontiac," XX, 158; "The Construction of Asphalt Pavements," XIX, 179; "Asphalt for Small Cities," XVIII, 42; "Causes of Asphalt Pavement Failures," XVIII, 18 and 319; "Cost of Asphalt Repairs," XVII, 14; "Table Showing Kind, Amount and Cost of Pavements in Various Cities," XIV, 18; XIII, 366; "A Study of Paving Materials," XV, 353; "Data on Asphalt and Brick Pavements," XVI, 298, 319; "The Life of Pavements," XVII, 272; "Pavement History of Lafayette," XIX, 317, 390; "Average Cost of Pavements in Newark," XIX, 297; "Pavements in Michigan Cities," XX, 297; "Pavement Guarantees," XXI, 288; "Cost of Street Paving in Iowa," XXII, 401; "Tractive Force on Pavements," XXII, 294. These are all important articles. There are many others upon all kinds of street paving materials.

Excellent discussions of the subject will also be found in Tillson's "Street Pavements and Paving Materials" ($4), Byrne's "Highway Construction" ($5), and Judson's "City Roads and Pavements" ($2).

SLATE FOR TOP DRESSING OF MACADAM.

Can you give us any information as to the use of crushed slate as top dressing for macadam pavement, and how it compares in durability and cost of repairs with trap rock or granite top dressing?

Geo. W. Bestor, Minneapolis, Minn.

Slate is too soft for top dressing of pavement and makes a very objectionable mud, which may be sticky enough to help carry off the stones of the foundation below. The writer has known of the use of shale which was nearly slate with very unsatisfactory results. A small proportion of the slate might be used with trap or granite as a binding material, but clay or clayey gravel would probably be found more satisfactory, as it could be more thoroughly distributed and the amount used more closely suited to the requirements of the case. Constant renewal as well as the necessary cleaning off of the old mud would indicate a more expensive maintenance for a less satisfactory pavement than granite or trap or good limestone.

WIDTH OF WAGON TIRES.

In which numbers of MUNICIPAL ENGINEERING will I find articles referring to the regulation of the width of wagon tires in proportion to the weight carried, and articles relating to the regulation of automobiles and bicyles? *Ernest Adam,*
Engr. Street and Sewer Department, Newark, N. J.

The following cover the subjects of the question, except automobiles, upon which we have published nothing: "Influence of Width of Tires on Roads," February, 1898; "Wide Tire Ordinance at Providence," February, 1897; "Experiments with Broad and Narrow Tires," June, 1897; "Defective Legislation on Wide Tires," January, 1897; "Wagon Wheel Tires," April, 1895; "Wheels and Tires," April, 1894; "Requirements as to Wheel Tires," May, 1894; "Economics of Wide Tire Wheels," June, 1894; "Street Repairs and Wide Tires," June, 1893; "Requirements as to Width of Tires," March, 1893; "New York Bicycle Ordinance," September, 1897.

STREET GRADES AND INTERSECTIONS.

I wish to know the best book on street grades and intersections. This is a subject which is touched upon very lightly in the engineering journals.

T. E. Petrie, Marion, Ind.

Byrne's "Highway Construction" ($5), has a very good discussion of the subject of street grades, and includes the adjustment

at street intersections. It is the fullest appearing in any book and covers fifteen pages or more. Tillson's "Street Pavements and Paving Materials" ($4) devotes less space to the subject but treats it well. Several discussions of the subjects of street grades and intersections have appeared in MUNICIPAL ENGINEERING, especially in the question department. Among them may be mentioned an article on "Street Grades" on page 357, volume XVI, by C. P. Chase, which is a very full discussion of the subject. The formula on page 362 is not correct, but can easily be derived by the reader. "Staking Grade for Streets," volume XXIII, page 28: "How Street Intersections Should be Planned," volume XVIII, page 167.

FLAGMEN AND GATES AT RAILROAD CROSSINGS.

What are the common provisions regarding gates and flagmen at railroad crossings of streets in cities? What are the legal requirements of the railroad companies in case there are no such ordinances? *Reader, Denver, Colo.*

The following form of ordinance seems to cover the ground very well in the case of flagmen:

"It shall be the duty of every person connected with the control or management of any railroad company to cause flagmen to be stationed at the following points, viz.: At the crossing of —— avenue and the sidewalks thereof by —— railroad," etc., etc.

"Provided, that in case where two or more railroads cross any one of the points before mentioned, or where the tracks of two or more railroads are within 200 feet of one another at the crossing of any one of the streets before mentioned, the persons connected with the control and management of any such railroad companies shall have the right to make a joint arrangement by which one flagman only shall be stationed at the best point from which he can signal every locomotive or railroad train."

A fine of $100 is provided for failure to place the flagmen.

"It shall be unlawful for any person to suffer, cause, or permit any locomotive, car or train to be run upon, along, or across any of the streets mentioned in section — hereof, unless a flagman has been duly stationed at such point, as by said section required, and is properly engaged in the performance of the duties required by the preceding section. Any and every person engaged in or about the conduct, control or management of any locomotive, train or car which shall be run upon such crossing may be fined $100."

Standing of cars on crossings is also prohibited under penalty of $100 fine.

The proviso for doubling up crossings under a single flagman should operate only on the crossings which have very little street traffic and railroad traffic.

Safety gates may be provided by an ordinance reading about as follows:

"The —— railway companies are, each of them, hereby required to erect and maintain safety gates on each side of their tracks where the same cross —— street, in the city of ——, within —— days from the taking effect of this ordinance.

"The gates required to be erected and maintained by the foregoing section shall be similar in construction and operation to those now in use at ——. A reliable and competent man shall be employed to operate each of said gates when erected, who shall be and remain at his post of duty from —— o'clock to ——, of each and every day when trains are running, except when relieved by some other competent and reliable person."

Failure to place and operate the gates is subject to $10 fine for each day of failure. The marshal is ordered to notify some officer or agent of each company, but his failure does not release the company.

As to the reciprocal rights of railroads and travelers to a road crossing, reference may be made to Elliott's "Law of Railroads" and "Law of Roads and Streets," from which the following is derived.

The rights of railroad companies and travelers at highway crossings are in all respects reciprocal, except that the railroad has the right of way and the traveler must await the passage of a train which he knows, or should know, is approaching, it being impossible for the trains to stop or even slacken speed for every crossing, at least in this country. But the train must make signals required by statute, on penalty of damages for accidents occurring on account of failure to make them. The traveler is required to listen and look for the signals, however. Even if signals are not required by statute they must be given if ordinary prudence requires them.

In a populous city, where signals can not be given, the trains must be run at such speed as not to jeopardize the safety of travelers on the highways, even in the absence of express state or municipal regulations. The speed must be so moderate that the sound of the bell or whistle will be heard in

time to be an effective warning, if there are no gates or flagmen to stop travelers when a train is approaching. Even if within the statutory limit, the railroad may be guilty of negligence if the crossing is a particularly dangerous one.

The municipality may require gates and flagmen, but if they are not so required, ordinary care and prudence may demand that they be put in by the company, and, in a populous city, their omission has been considered negligence, even in the absence of ordinances providing for them. The relative duties and the question of negligence are questions for the jury in any particular case.

If the railroad company puts a flagman at a crossing, his negligent failure to perform his duties is negligence of the company. His withdrawal without due public notice is also negligence. The presence of an open gate at a crossing is an invitation to cross and evidence of negligence in case of accident. Failure to comply with ordinances requiring flagmen or gates is evidence of negligence.

Some authorities say that statutory provisions are merely cumulative and do not release the company from such additional precautions as peculiar circumstances may demand, *i. e.*, they represent the minimum of care required, and ordinarily compliance with them is sufficient. But the company is not required to exercise extraordinary care by using every possible means to prevent injury, being bound only to use reasonable precautions, proportioned to the chances of injury at each crossing.

WATER COST AND WATER WASTE.

I am interested in the subject of water cost and water waste, discussed by A. L. Holmes in MUNICIPAL ENGINEERING for July, and desire to get all the information I can in regard to this matter. If you can direct me to additional information I will appreciate the favor. *T. M. Zink, Le Mars, Ia.*

The question of water waste and methods of prevention is frequently discussed in editorials, articles by correspondents, and papers before societies, given in MUNICIPAL ENGINEERING. Every volume contains more or less material upon this subject. Some of those which contain data as well as argument may be found as follows: "The Water Meter as a Sanitary Agent," vol. XXI, p. 312; "Beneficial Effect of Water Meters at Asbury Park," XXI, 102; "Water Waste and Its Causes," XXI, 417; "Cost of Installing a Water Meter System," XX, 280, with discussion on page 273; "Effect of Water Meters at Oberlin, O.," XXI, 355; "Water Meters Recommended at Buffalo," XXI, 162; "Fixing Water Rates," XXI, 346; "Harrisburg's Experience with Water Meters," XIX, 430; "Water Meters at Halifax," XIX, 362; "Water Waste Prevention," XIX, 282; "Water Waste," XVIII, 117; "Water Waste at Bradford, Pa.," XVIII, 331; "Causes of Water Waste," XVIII, 317; "Water Waste in New York," XVIII, 324; "An Instance of Water Waste," XVII, 366; "Restriction of the Waste of Water," XVI, 302; "Water Meters in Richmond," XVI, 394; "Water Meters and Rates," XV, 17; "Examination of Financial Statements of Municipal Water-Works," XV, 10; "Cost of Pumpage of Water," XIV, 142, etc.

Much upon the subject of water waste will be found in the "Inquiry Into the Conditions Relating to the Water Supply of New York," made by the Merchants' Association, a volume of over 600 pages. It is also discussed in Meyer's "Water Waste Prevention."

The cost of furnishing water can usually be computed from data in annual reports. In our department of reviews of municipal reports will be found such figures from month to month.

BAD ODOR IN UNDERGROUND WATER.

We have a water plant with standpipe 110 by 12 feet, a set of mains from 8 inches to 4 inches, three main streets and eight cross streets. We experience trouble with a stale odor in the water at times, especially during the summer. We flush the mains through occasionally with nearly a standpipe full of water, not the whole quantity at once, but moving to several hydrants each day. After flushing till it seems to run clear, there is still a sediment in the water as of iron rust or red paint, but after a while it settles and is clear again, yet after another flushing is as bad as ever. We cleaned the standpipe out and found a sediment like paint and rust at the bottom, but it must have got into the mains or the latter have rusted. The mains are iron and were coated when first put in. Our wells are tubular, 140 feet deep, down to the second stratum of water.

Can you tell us the reason why this is so, and a remedy for the same?

What is the usual way to coat the inside of a standpipe? Also the outside?

W. C., Harvard, Neb.

Reference may be made to page 27 of MUNICIPAL ENGINEERING for January, 1902, and to the answer in this department under the heading "Bad Odor in Reservoir Water." It is not probable that the pipes and standpipe rust sufficiently to produce the trouble complained of.

Possibly there is much iron in the water supply which, on contact with the air, is rendered insoluble and then is deposited.

Some works use the air lift partly to aerate the water, which then is allowed a time to settle in a covered basin. The cover is necessary, as growths will spring up in the water if it is exposed to the sun.

It is probable, however, that the trouble is caused by crenothrix, an organism which can grow in the dark and which requires a small amount of iron in the water as a part of its food. If this is true, it will not be easy to get rid of it. In the proceedings of the American Water-Works Association for 1898 will be found a paper by Owen T. Smith giving a description of his battle with crenothrix. He found the growth in the suction pipe at certain seasons of the year, and by keeping this clean he prevented the deposit of the products of its decay in the pipes and thus obviated both the stale taste and odor and the reddish deposit. In the discussion of the paper Mr. Heim stated that the crenothrix got into wells by the leakage of the ground water, or the water from upper layers, into them, and recommended the complete casing out of all water except that from the stratum in use, so that when the organism was once thoroughly eliminated it would not return.

Frequent cleaning of standpipe and distribution mains, perhaps using mechanical means of flushing the pipes, is suggested until the pest is entirely removed. Covering the standpipe may also be advisable.

The employment of an expert in this line may save much time and trouble, and possibly money, as he can probably tell from an examination at the proper time of year exactly what causes the trouble, and what is the best method of removing it and preventing it for the future in this particular case.

FORMULÆ FOR FLOW OF WATER.

Please give the formula for calculating the discharge in flumes, *i. e.*, what reduction should be made for friction. I want the number of gallons of water that will discharge from a flume 7¼ inches deep, 14 inches wide in the clear, having a velocity of 92 feet in 35 seconds. The flume is made of boards.

Could the flow over a weir constructed as follows be obtained correctly from a weir table: The weir was an inch board 7 feet long across the stream and the depths from surface of pond to top of board were, at one end, 1¾ inches; middle, 2⅛ inches; opposite end, 2 inches. The measurement is somewhat less where the stream is contracted above the board.

R. S. Jackson, Aberdeen, Wash.

The ordinary formulæ for computing the flow in a rectangular channel are in terms of the slope, s, the hydraulic mean radius, r, and a coefficient c. The quantity of water, q, equals the area of cross section, a, multiplied by the velocity of flow, v.

The velocity of flow, v, in cubic feet per second equals c times the square root of the product of r and s, i. e., $v = c\sqrt{r\ s}$.

If b is the breadth of open rectangular channel and d its depth,

$$r = \frac{bd}{b + 2\,d}$$

From experiments with unplaned plank in flume nearly 4 feet wide the value of c for water 0.67 foot deep was found to be 112 and for water 0.89 foot to 1.00 foot deep, 114.

In the case given the velocity is found by direct experiment to be 2.63 feet per second, but the method of determining the velocity is not stated. The mean velocity will be less than the velocity stated, and it is frequently assumed that it is 0.8 the maximum velocity on the surface of the water. This assumption is not accurate and may be wrong by 10 or 15 per cent., or more in special cases. Under it, the average velocity in this case would be 2.104 feet per second and the area, 0.604 x 1.167 feet, or 0.705 square feet. The discharge would then be 1.48 cubic feet a second, with a possible error of perhaps 0.25 cubic feet.

The Francis formula is usually accepted as giving the discharge over a sharp-edged weir with great accuracy. This formula assumes that the weir is a level and straight line, so that the depth of water measured from the weir edge to the surface of still water several feet back of the dam will be the same for all parts of the weir. A weir an inch thick may be considered a thin edge for large depth and discharge. For an experiment like the one cited in the question, the discharge will be slightly less than that computed by the formula, but the difference is not as great as that due to the differences in elevation of the weir stated.

The Francis formula is

$$q = 3.33\ l\ h^{\frac{3}{2}}$$

if the weir has no end contractions. If it has, the length of the weir must be reduced by 0.1 h for each such contraction. The effect of difference in depth of flow on the weir is shown by the results of the computation. If the depth be assumed at 1¾ inches the discharge by the formula is 1.3 cubic feet a second. If it be assumed at 2⅛ inches the discharge is 1.74 cubic feet a second. Three per cent. must be deducted for two end contractions if they exist. The

actual discharge is between these two limits. The necessity of exact measurements and of exact construction of the apparatus are shown by the variations quoted. For small discharges, the utmost accuracy can not be attained without a hook gauge.

BAD ODOR IN RESERVOIR WATER.

Our water pond has become contaminated recently by what I am inclined to believe is a vegetable growth which gives it a fishy odor. Is there any effective remedy for it? *Geo. C. Blance,*
Winter Harbor, Me.

This question is quite fully discussed on page 27 of MUNICIPAL ENGINEERING for January, 1902, where it is stated that such odors are generally due to low forms of vegetable and animal life. A number of remedies, suggested and tested, are given, and a recommendation that the subject be referred to an expert in this line if the odors are very troublesome. They are not usually signs of unwholesome water. Whipple's "Microscopy of Drinking Water" ($3.50) gives the fullest discussion of the subject presented in an engineering publication.

DATA ON MUNICIPAL OWNERSHIP OF WATER-WORKS.

I will be obliged for references to publications giving data as to the municipal ownership of water-works. *A. A. Powe, City Clerk,*
South McAlester, Ind. Ter.

A few of the articles upon municipal ownership of water-works, which have appeared in MUNICIPAL ENGINEERING are the following: "Municipal Ownership," by L. N. Case, vol. XX, p. 216, and XXI, 16; "Examination of Financial Statements of Municipal Water-Works," XV, 10; "Limitations of Municipal Ownership," XVII, 343; "Private *v.* Municipal Ownership," XVII, 126; "Municipal Ownership of Combined Water-Works and Electric Light Plants," XVIII, 147; "How Politics Detrimentally Affects Efficiency in Municipal Management," XIX, 32; "Public Water Supplies," XX, 31; "Successful Public Water-Works Plant," XI, 216; "Private and Municipal Ownership of Water-Works," XI, 367; "Municipal Ownership of Water-Works," reports from seven public and private plants, XII, 245; "Municipal Ownership and Permanence in Management," XIII, 357; "A Form of Municipal Control of Water-Works," XIV, 275 and 347; "Municipal Ownership and Municipal Control," XIV, 1; "A Successful Substitute for Municipal Ownership," XIV, 181; "Municipal Ownership," XV, 172; "City Ownership of Water-Works at Kingston, Ont.," XV, 42; "Town Water-Works from a Financial Standpoint," XV, 341; "Municipal Control of Water-Works in England," XVI, 187; "Municipal Ownership of Water-Works," XVI, 37; "Municipal or Private Ownership or Control," XVII, 195; "Municipal Ownership of Water-Works," XVII, 87.

Books and pamphlets discussing the subject may be mentioned as follows: Francisco's "Municipal Ownership, its Fallacy" (50 cents); "Bibliography of Municipal Problems and City Conditions" (50 cents), giving many names of books and articles; Foote's "Municipal Public Service Industries" ($1).

USE OF STREET SPRINKLERS ON METERED SERVICES.

We have several parties in the residence portion of the city who have street sprinklers on their meters. They are sprinkling beyond their premises and clear across the street, hence sprinkling in front of other residences, and keeping the other said residents from putting in sprinklers. The parties claim that as they are on meters they can sprinkle as far as they see fit, so long as they pay for the water. Our rules on flat rates for sprinkling purposes are confined to the lines of the premises and half way into the street. Is the position of our patrons correct, or would we be entitled to hold them down to their own premises and half way into the street? *Sprinkler, ——, Miss.*

If the water company wishes to restrict sprinkling from metered services in the same way as for flat rate services it would seem to be easy to do it by adopting the proper regulation if the present regulation does not cover the case.

Whether such a regulation is advisable is another question. If there is a minimum charge for metered water and the houses for which the sprinkling is done are all supplied with water, it is easy to assume a case in which it is to the advantage of the water company to allow one consumer to do the sprinkling for the neighborhood. He pays for the water he uses, and doubtless pays more than the minimum rate. His neighbors, relieved of the sprinkling, may use less water than the minimum rate pays for, so that the company gets more money for its water than if the sprinkling were distributed about the neighborhood, as then each would use some water for that purpose before his meter would register above the minimum charge. Doubtless in some cases the present procedure might result in some loss of revenue, especially where the neighbors do not have water connections. The case needs to be studied with the rate-book and water-meter ledger in hand.

AIR CHAMBERS ON PUMPS.

Can you advise me as to the best way to provide air chambers on pumps with air, or to prevent hammering of pumps, the noise of which extends all along the line? The water comes to pumps under a head of about 80 feet, and is pumped against a head of 200 feet. Is there any way to make service connections to prevent the noise being heard in the houses? *Geo. C. Blance, Winter Harbor, Me.*

An air pump can be used to supply the air chamber, or, in suction pumps, a small check-valve connected with a pump chamber so that a small amount of air can be drawn in when the water is drawn up. Possibly the difficulty is with the size of the air chamber, which should be at least five or six times the displacement of one piston. The greater the pressure the greater the size of the chamber. Fanning's formula multiplies the displacement of the piston by the pressure per square inch and the ratio of "excess of delivery" of the pump during a half stroke. The subject is discussed in more detail in MUNICIPAL ENGINEERING, volume XXI, page 401. A standpipe has a similar office in a water distribution system. An air chamber on a house connection might reduce the hammer in that connection, but would not cut off the sound transmitted along the pipes. See also, volume XXII, page 95.

POLLUTION OF STREAM BY SEWAGE.

We are about to put in sewerage and have several good-sized streams of water into which to empty. I would like to know how far from the sewer outlet any one could sue for damages on account of the sewage passing through their lands.

James G. Ryan, Supt. Water Dept., High Point, N. C.

The answer to this question depends upon so many considerations that it can not be made definite. The question of sewage pollution of streams in objectionable amount is comparatively new in this country, and has not had the careful consideration by legislatures and courts which its importance deserves. In those states where nuisances have been created or where water supplies have been polluted, the laws and the court rulings are much more strict than in the newer states and those in which the cities are relatively small in proportion to the streams into which they discharge their sewage. Thus, in Massachusetts no sewage can be discharged into a stream without complying with the rulings of the State Board of Health, which usually require purification practically equivalent to producing drinking water; while in Indiana the courts rule that the streams are the natural sewers, and owners of land below a city sewer hold their property under the burden of whatever damage the city may inflict in the way of pollution by sewage. However, factories have been enjoined and required to pay damages for the pollution of similar streams.

The decisions of courts in North Carolina can not be predicted from a consideration of those in other states. There are all kinds of precedents, and the variations in statutes and in interpretations of common law are almost as numerous as the decisions that have been made.

From the practical engineering standpoint it is not so difficult for an experienced observer of conditions, with the aid of some chemical and bacteriological analyses, perhaps, to make an estimate of the probable effect of the new conditions and the possibilty of damage to owners of land or water rights along the streams. The proportion of dilution has much to do with the matter. A small amount of sewage, highly diluted, may quickly disappear, while an amount near the amount of clear water in the stream may cause serious nuisance which, under conditions existing during a large part of the year, will increase, until flood waters wash out the offending deposits and growths. The method of flow in the stream, opportunities for sedimentation and aeration, obstructions, uses to which the water is put, are some of the points requiring consideration also. A full and reasonably safe answer to the question can only be given by an expert after personal inspection and consideration of all the conditions.

DEALERS IN SAND PUMPS.

Can you give me the names of dealers in sand pumps and similar apparatus for pumping sand and dirt from the bottom of streams?

Subscriber, ——, Ky.

Contractors' sand and dredging pumps are probably what are needed, such as doubtless can be obtained of the Edson Mfg. Co. and the Boston & Lockport Block Co., of Boston, Mass.; Lake City Engineering Co., of Erie, Pa.; Urie Mining and Machinery Co., Kansas City, Mo.; Macleod & Clark, Cincinnati, O., etc. Centrifugal pumps, made by Irwin Van Wie, 713 W. Fayette street, Syracuse, N. Y., can often be used for such work, and sometimes the pulsometer, made by the Pulsometer Steam Pump Co., 135 Greenwich street, New York. The common sand pump for wells can be obtained of dealers in well-drivers' supplies, such as the

American Well Works, Aurora, Ill.; The Cook Well Co., St. Louis, Mo. Torbert & Peckham, Chicago, have second-hand contractors' supplies of the sort desired.

FLOW IN SEWER.

Will you kindly inform me if a pipe 24 inches in diameter having a fall of 52 feet in 520 is of sufficient capacity to take care of all water brought to it by a sewer 30 inches in diameter having a fall of 0.67 foot in 100 feet? If so, how much more could it carry? The question is raised by the populace, doctors, lawyers, etc., not by engineers.

Subscriber, Monticello, Ind.

Tables computed from Kutter's formula give the velocity of flow in the 30-inch sewer practically 7 feet a second when running full, and the discharge at 34 cubic feet a second. If the velocity of flow in the 24-inch pipe were about 12 feet a second, it would carry the entire discharge of the 30-inch sewer. But, if proper arrangements are made for getting water into the 24-inch pipe, the velocity, flowing full, on the gradient of one in ten, would be nearly five times 12 feet and the discharge correspondingly greater.

The outlet pipe flowing full may be discussed rather as a pipe under pressure than as a sewer pipe, and the problem would be to introduce the water into it so as to keep it full. As stated, the 24-inch outlet pipe would not be filled much more than one-fifth full by the discharge from the 30-inch pipe. Money could be saved by reducing the size of outlet still more, if a proper screening chamber and tank for inlet is put at the junction. As the 520 feet of outlet is undoubtedly iron pipe a reduction in size makes considerable difference in cost of material.

GARBAGE CREMATORIES.

Will you have the kindness to inform me of the best firms from whom to purchase crematories for the destruction of city garbage?

J. F. Echeverria, ——, Costa Rica.

Many of the garbage crematories which have been tried are described in Chapin's "Municipal Sanitation in the United States," which gives some idea of the success of their operation. The latest forms are not included. Among those which are reported to give the best satisfaction may be mentioned the "Engle," manufactured by the Engle Sanitary and Cremation Co., Des Moines, Iowa; those made by the Decarie Manufacturing Co., Minneapolis, Minn.; the Davis Garbage Furnace Co., Lancaster, Pa.; the Bridgeport Boiler Works, Bridgeport, Conn. Other furnaces giving satisfaction under proper construction and management, are the Smith, Thackeray, Dixon, Rider, Lester. The reported cost of destruction varies from nearly zero, in furnaces in which the garbage is the only fuel, to $1.08 a ton. A few experiments in making steam in a garbage furnace are in progress in this country, but have not yet proved economical. There are two or three English furnaces which succeed in supplying a satisfactory amount of steam and thus aid in paying the expenses of garbage removal. The conditions are not the same as in American cities, and the same furnaces will probably not be equally successful in this country.

MEASUREMENT OF LIGHTS AND ELECTRIC CURRENT.

Can you give reference to some practical method of measuring the candle power of arc and incandescent lights? What is the use and application of the volt meter? *Subscriber, Kokomo, Ind.*

Weber's photometer is one of the standard forms. The illumination received upon a screen from a small standard amyl acetate or benzine lamp is there compared with the illumination to be measured. The apparatus is somewhat cumbersome and a portable lamp is not always reliable. The colors of the illumination may also differ. For these reasons the portable instrument is not so accurate as that used in the laboratory. Trotter's photometer uses a small electric light and compares the illumination furnished by it with that to be measured, the illumination by the latter light being reduced by reflection from a mirror whose angle may be changed. The small electric light is not strictly uniform and thus presents a source of error. Houston and Kenelly's "illuminometer" can be used as a photometer. Its action depends upon the assumption that a constant amount of light is necessary to make a certain object visible. The selected object is put in a box where it can be observed through a focussing eyepiece, and is illuminated through a window in the top of the box, covered with porcelain or opal glass. A shutter can be moved to shut off the light until the object can barely be seen. A few lines of type to be read is the object chosen by the inventors. A scale on the shutter, calibrated by comparison in a laboratory photometer, gives the number of light units delivered at the point of observation or the candle power of the source of light at that point. Ordinary photometric observations are subject

to errors of about five per cent., and the inventors state that those by this instrument may vary about ten per cent.

The candle power of electric lights is not the same in all directions from the center of the light, and the usual contract for lighting is indefinite on this account. In some direction in which the light is not needed it may equal or exceed the contract candle power, while the average candle power in the entire sphere is below the requirements and in some directions is certain to be far below. There is great difference in various arc lights and incandescent lights in this regard, and the style of lamp should be chosen for the kind and distribution of illumination desired.

Studies of the distribution of illumination have been made by several experimenters and the conclusion reached seems to be that the contract should call for certain distribution of certain power of illumination rather than for simple candle power of lamp in one direction or in the average of the entire sphere. The photometers and the illuminator described are portable and better suited to the measure of illumination and a study of its distribution than to the measure of the candle power of lamps, since they do not entirely exclude all sources of light but the one whose value is desired. An excellent photometer is made by the Electric Motor and Equipment Company.

The principles of the action of volt meters are explained in the text-books upon electric lighting and power. They differ according to the amount of power to be measured and other conditions of its generation. The Weston volt-meter gives its indications of the strength of the current passing by means of the rotation of a coil set in a space in the pole pieces of a powerful horseshoe magnet, the rotation caused by passing the current through the coil being toward a position at right angles to the lines of magnetic force and in opposition to springs. The amount of rotation is proportional to the current strength, and is shown by the pointer on a properly calibrated scale. Ayrton and Perry's depends simply upon the torsion of a spring by electro-magnetic attraction produced by the current to be measured. The Wirt compares the current, by means of a galvanometer, with that of a battery which forms a part of the instrument and whose electro motive force is known. The Cardew depends upon the expansion of a wire from heat generated by the passage of the current through it.

BOOKS ON ARCHITECTURE AND BOOKKEEPING.

Will you please inform me where I can get a good text-book on bookkeeping for general construction work? Also one on architecture, and the price of each? *L. Hamann, Davenport, Ia.*

In addition to the instruction in the ordinary text-books on bookkeeping, perhaps Millener's "Cost Accounts," which was reviewed in MUNICIPAL ENGINEERING for March, 1902, will give the desired instruction. The detailed working out for a special case refers to the manufacture of Portland cement, but the principles are so well stated and the example is so well chosen that it should not be difficult to make the application to any other manufacturing or construction work.

It is difficult to choose a book on architecture without some idea in detail of what kind of book is wanted. The books range from instructions to carpenters and masons to disquisitions on the philosophy of architecture and no one book can cover the ground. Rosengarten's "Hand-book of Architectural Styles" ($2.50) is perhaps the most satisfactory general view of the entire field and history of the subject. Fergusson's books are the standards on history, the general history costing $7.50, the history of modern styles $10, and Indian and Eastern architecture $10. The books on architectural styles and details are very numerous and cover all classes of buildings from cottages to cathedrals; so are the histories of various styles, forms and movements. Rosengarten makes a very good introduction to the field. MUNICIPAL ENGINEERING COMPANY can furnish any books desired at the prices named.

MUNICIPAL YEAR BOOK.

In your June issue you refer to the forthcoming Municipal Year Book. Will you kindly advise me where we can secure a copy of the same?

F. K. Rhines, Toledo, Ohio.

The "Municipal Year Book" is now issued and contains much information regarding municipal and public service industries, including names of officials. MUNICIPAL ENGINEERING COMPANY can supply it at the publisher's price, $3.

WALL TIES.

We would like to know where we can get some wall ties for brick walls. Where we lay a 4-inch wall we want something to fasten to the sheathing and then lay on the brick.

Hjerpe & Munson, Galesburg, Ill.

The following are listed as makers of wall ties, and can doubtless supply what is

wanted: Cleveland Wire Spring Co., Cleveland, Ohio; Wm. H. Geis & Co., Cincinnati, Ohio; S. J. Hewson & Co., Minneapolis, Minn.; Illinois Supply and Construction Co., St. Louis, Mo.

CEMETERY PLANS.

Can you give me the names and prices of any books on the laying out of cemeteries and giving plans of some that have been laid out? The size of plat is about twelve acres.

R. E. Vandruff, Waynesburg, Pa.

Loudon's "Encyclopedia of Gardening" ($7.50) and Parsons' "Landscape Gardening" ($3.50) are two books which will furnish valuable information. "Modern Cemeteries" (50 cents) is a compilation of forty papers read before the Association of American Cemetery Superintendents, which doubtless contains much of value in this connection. "Park and Cemetery" ($1 a year) is a periodical devoted to landscape gardening, and some of the plans desired can probably be obtained in back numbers.

GASOLINE AND ACETYLENE FOR CITY LIGHT.

Which is the better light for cities, acetylene or gasoline, and which is the cheaper?

J. F. Echeverria, San Jose, Costa Rica.

The first is a question which can hardly be answered categorically at this time. Gasoline lamps have been vastly improved within a few years, and acetylene has hardly had sufficient trial to warrant a statement of its capabilities.

It seems to be determined that the most satisfactory results with acetylene are obtained if the gas is generated at a central station and is distributed in pipes to the lamps. This gives an opportunity to purify the gas and regulate the pressure, and thus insure steady light of the highest candle power. Gasoline lamps for city lighting are individual units, each being filled with its supply of fluid each day or so and set to burn the required number of hours, when its supply runs out and it extinguishes itself. This difference in method of installation may make the decision in some cases. The first cost of the installation is less for the gasoline lights by almost all the expense of the generating plant and the piping. Isolated lights and those at long intervals in city suburbs can be installed at very much less cost for gasoline. The cost of taking care of the lights is less for acetylene. The cost of gasoline is doubtless less than the cost of generating acetylene, so that the total cost of gasoline is less than that of acetylene. The acetylene light is more powerful than the gasoline light and will give better satisfaction on this account with the same number of lights, or the number of lights can be reduced.

Details of the cost and of the methods of installation of the two systems can be obtained from the firms listed in the business directory in our advertising columns under "Acetylene Gas Machinery" and "Gas and Gasoline Lamps." An article on "Acetylene Plants for Villages" will be found elsewhere in this number.

INDEX TO MUNICIPAL ENGINEERING.

How are you getting on with your index to back numbers of MUNICIPAL ENGINEERING? If you are not going to publish I shall make one up for myself, but as it is rather a big undertaking I prefer to buy one. *Geo. W. Bagge, Melrose, Mass.*

A similar inquiry for index comes from Ernest Adam, Newark, N. J.

The index is growing rapidly this summer and we expect to have it ready to print this fall. We have had a number of inquiries and promises to purchase, and wish our readers would notify us at an early day if they wish the index, that we may know in what form the demand will warrant printing it.

CONCRETE AND MELAN ARCHES.*

By L. K. Sherman, Chicago, Ill.

The methods in common practice for the design and computation of stresses in voussoir arches are recognized as unsatisfactory. These methods are still more unsatisfactory when applied to concrete and Melan arches.

The "Elastic Theory" for the calculation of arches was first presented to general notice by Weyrauch in 1879. This method is based on the well-known law that "the stress is proportional to the strain" for homogeneous materials within the working limits of stress. The most valuable investigations that have been made in arches are a series of tests made by the Austrian Society of Engineers and

* From a paper before the Illinois Society of Engineers.

Architects. Numerous abstracts of these tests have been published. We will give here only an outline of the results. Tests were made on five arches, all of which had a span of 75.4 feet and a clear rise of 15.1 feet. They are as follows:

	Material.	Thickness. Crown.	Thickness. Skewbacks.	Ultimate load. lbs. per sq. foot over half span.
1.	Rough quarry stone	23.6 in.	43.3 in.	660
2.	Brick	23.6 in.	43.6 in.	602
3	Concrete	27.6 in.	27.6 in.	742
4.	Melan	13.8 in.	23.6 in.	1,300
5	Steel	....	....	1,564

The very important conclusion drawn from these experiments by the Austrian society was that masonry arches behaved very nearly as elastic arches fixed at the ends. Also that all large arches should be designed according to the Elastic Theory.

The best work on the computations of arches that the writer knows of is "A Treatise on Arches" by Prof. M A. Howe. The formulae which Prof. Howe presents are based on the Elastic Theory and are in such shape as to be readily applied in practice. Numerous tables assist in the labor of performing the reductions for any case.

What I wish to emphasize is this: First. The method of elasticity is the proper one for computation of arches of either steel or masonry. Second. I would propose, as a scheme for simplifying computations by the method of elasticity, that a series of diagrams be made which would cover any type or any shape of arch. With such an arrangement the stresses in an arch could be computed as quickly and I believe as accurately as the stresses in a truss bridge of the same span.

The diagrams are suggested as preferable in practice, as there is little liability of numerical errors and checks and comparisons are readily made.

Design. The rise of an arch is generally fixed by the distance of the roadway above the stream or crossing. The shape is governed by the ratio of rise to span and the architectural effect in relation to the surroundings. The thickness of the ring of fixed arches should increase from crown to abutments. The three-hinged arch should be thickest theoretically at the haunches. A fixed arch is more rigid and free from vibration than a hinged arch. The fixed arch should be used wherever a solid foundation exists. If, however, there is danger of any movement of the abutments the three-hinged arch should be used, for any slight movement to abutments of a fixed arch makes a decided change in stresses and may produce cracks. Among European engineers it is general practice to leave joints or temporary hinges in the arch during construction. After the centers are removed the joints are closed up and the arch acts as fixed for additional or live loads. The idea is to keep the line of resistance definitely located at the hinges in spite of the stresses that are set up by the sag of the arch when centers are removed.

The writer does not consider that temperature stresses demand hinges in any type of arch. It is proper, however, to consider the stresses due to temperature. Temperature changes may cause a crack in the spandrel wall over the springing and it is well to provide this wall with a joint. Prof. Pence, in a paper before the Western Society of Engineers, gives the co-efficient of expansion of concrete as .000055 per degree Fahr. The success that has been met with in combinations of concrete and steel is due largely to the fact that there is not a great difference between the co-efficients of expansion of the two materials and also that there is a remarkably strong adhesion of cement to iron, from 400 to 600 pounds per sq. inch.

Mr. Edwin Thacher, M. Am. Soc. C. E., who has designed and built a large number of Melan arches, has presented formulae for symmetrical sections.

The principle that these formulae are based on and which should be the basis for calculation of stress in all composite structures of concrete and metal is this. Suppose we have a rod of iron surrounded with a layer of concrete and subject to a tensile stress. At any section the bar will be elongated a certain amount and with it the surrounding concrete will be elongated the same amount. From Hook's law the stresses are proportional to the strains within the working limits of the materials. Taking the modulus of elasticity of iron at 28,000,000 and the modulus of elasticity of concrete at 1,400,000 pounds per sq. inch, a pull which will elongate the composite bar 1-1,400,000 part of its length, will cause a stress of one pound per sq. inch in the concrete and 20 pounds per sq. inch in the iron. The same thing holds true for the composite rod under compression, the stress in the iron being twenty times the stress in the surrounding concrete. Hence we have the following important principle for composite concrete and metal structures. The

stresses in the concrete and in the metal are in proportion to each other as their relative moduli of elasticity. Mr. Thacher has used the above ratio of 1 to 20 which is very nearly the figure determined by the Austrian Society of Engineers. Tests made on smaller specimens of concrete have given results which reduce this ratio.

Messrs. A. L. Johnson and A. L. Watson, in the proceedings of the Am. Soc. C. E., report some tests of concrete steel beams made at the Massachusetts Institute of Technology. Their results indicated that Hook's law did not apply exactly to composite beams. Also that the metal carried a larger stress in tension, without concrete cracking, than theory allows. This may modify the unit-working stresses to be used, but the deviation of the tests is not sufficient to alter the above theory as a basis for investigations.

For preliminary calculations for thickness of concrete arches at the crown use Trautwine's rule:

Thickness at crown equals one-fourth the square root of the sum of the radius and the half-span, plus 0.2 feet.

For Melan arches the thickness at crown may be reduced according to the amount of metal used. The following rule for preliminary purposes is proposed for Melan arches:

Crown thickness equals depth by Trautwine's rule, minus ten times the area of the iron beams divided by the horizontal distance between beams.

Materials and Construction—In regard to concrete for arches we will touch on the subject only so far as it applies especially to arches. Concrete for the arch ring should be made of first-class Portland cement with proportions not exceeding one part cement to seven of aggregates. Concrete should be thoroughly tamped in layers six or eight inches thick. Thorough mixing is necessary, and concrete is improved by mixing in proportion to the number of turnings beyond the amount usually given.

The amount of water to be used in concrete depends on the condition of the materials and on the weather. The writer has had quite a wide experience on concrete construction, and prefers a fairly wet or quaking mixture to a dry concrete. Voids in mortar and concrete are never entirely filled with cement and sand, and a considerable excess of water can be carried by the concrete without reducing its density. In an arch ring, however, the concrete should be a little dryer than usual. This necessitates extra tamping.

If possible the arch ring should be constructed without interruption in one section. Should conditions compel a delay the work should be ended off in a radial line.

The facing mortar should be placed at the same time as the concrete and bonded with it.

A mortar composed of one cement to three sand is as durable for facing as a one to two mixture and is less liable to crack during the process of setting.

There is need for more definite methods for specifying the proportion of cement in mortar and concrete.

While tests of cement and proper specifications are important the most essential factor in securing first-class concrete is proper inspection or supervision during construction, without this the best set of specifications ever written are only waste paper. On Cooper's bridge specifications is written "the most perfect system of rules to insure success and must be interpreted upon the broad grounds of professional intelligence and common sense." This may be true but the average contractor does not interpret specifications this way. While it is all right to have descriptive portions in a specification, when it comes to the requirements state what you want so there shall be no doubt and stick to it. Do not call for work that you do not expect to carry out or for work or materials that are beyond good general practice. Such procedure is unfair to different bidders for the work and is a mean way of shifting your responsibility for the work on to some poor devil of an inspector.

There are numerous patents in connection with concrete iron construction. Wherever the work involves the use of patent rights and is to be let out to bidders on contract it is best to secure the use of such patents beforehand and not leave it to the bidders. Unless this is done one bidder is liable to have an unfair advantage over others and the cost of the work will be increased from lack of competition.

The principal advantage of the arch over a truss or girder bridge is in beauty and durability.

A concrete arch is cheaper than a stone arch nearly in proportion as concrete is cheaper than cut stone masonry. A Melan arch or a concrete arch reinforced with imbedded iron beams can be so designed that it will be cheaper than the plain concrete structure. In addition the Melan arch carries a large reserve force or factor of safety. Ordinarily, as has been explained, the full working value of the iron cannot be used, but in case of any accident, if the concrete was fractured, the full strength of the iron would

be called into play and would be capable of carrying a large load.

The question of relative cost between the arch and the steel truss is so dependent on local conditions that no general comparison can be made. There are many cases, where foundations are favorable, where the first cost of the arch will be less than the first cost of the truss. Moreover, the concrete arch utilizes local labor and materials to a greater extent than an iron bridge does.

There are cases, if durability, cost of painting and repairs are considered, where the arch is more economical even though first cost is greater. Among other roads, in the line of permanent construction, the Illinois Central Railway has removed a number of iron bridges and replaced them by concrete arches.

Again the element of beauty is an important feature, in parks, boulevards or city streets. Aside from its utility an arch bridge can be a handsome monument to a town and a credit to its owners, for a thing of beauty is a joy forever.

MUNICIPAL MATTERS IN COURT.

[Prepared for MUNICIPAL ENGINEERING MAGAZINE by Andrews & Murdoch.]

Appointments to Future Vacancies—It is a well-recognized principle that an existing municipal board or body cannot appoint to an office which is to come into existence or become vacant in the life of the same board or body at a time when it will be differently constituted. State vs. Mayor, etc., of Jersey City et al., 52 At. Rep. (N. J.) 278.

Delay in Performing Contract—One who contracts to construct water works for a borough is responsible for failure to complete it within the time stipulated, so far as this is caused by his delaying work, before time for first payment, because the borough had not yet sold its bonds issued to provide the means of payment, but not so far as caused by his delay on account of default in the making of payments. Chandley et al. vs. Borough of Cambridge Springs, 52 At. Rep. (Pa.) 87.

Encroachment on Street—A municipal corporation, in the absence of a statutory grant of such power, cannot authorize the erection in city streets of a building which constitutes a nuisance. An encroachment of twenty-two inches on the sidewalk by pillars of a building is a public nuisance, without regard to whether they are erected for ornament or [illegible] ity The easement of view from every part of a public street, as well as that of light and air, belongs, as a valuable right, to one owning property abutting on the street, and will be protected by the courts against illegal encroachments. First Nat. Bank of Montgomery vs. Tyson, 32 So. Rep. (Ala.) 144.

Gutter Crossings—Evidence that other gutter crossings in the city were in a similar condition to that of the one where the accident occurred is competent to show want of negligence of the city, and also contributory negligence of the traveler injured. Heiss vs. City of Lancaster. 52 At. Rep. (Pa.) 201.

Invalid Assessment—Where a paving ordinance called for a foundation of six inches of crushed limestone, but the contract called for slag, and no limestone was used, an assessment therefor was invalid. Young et al. vs. People ex rel. Raymond, 63 N. E. Rep. (Ill.) 1075.

Nuisance—A pile of brick four feet high and five feet square, placed at one side of a street by the city to be used for paving purposes, and left there more than two months, does not constitute a nuisance, where the paving has not been completed, but is in the course of construction a short distance therefrom. Pinnis vs. City of Dunham, 41 S. E. Rep. (N. C.) 932.

Pavement—Repairs—Withholding Payment—Where the contract for the paving of a street provided that, after acceptance of the work, a portion of the sum due should be retained and paid in annual installments, provided the contractor should keep the pavement in repair as required by the commissioner, and that the commissioner should have the right to make repairs on the company's default, and charge the same to the sum due, in an action for an installment, plaintiff having shown the original work done, but failed to show the pavement kept in repair, it was proper to dismiss the complaint. O'Keeffe vs. City of New York, 76 N. Y. Supp. 796.

Paving Contracts—Alien Employes—Where an ordinance of a city of the third class provides that in future paving contracts a clause shall be embodied that the contractor shall not employ workmen who are not citizens of the United States, and residents of the city, and a subsequent paving ordinance and contract has not embodied in them such clause, the ordinance requiring such clause is not a part of the contract, although referred to

in an addendum to the contract under the heading "Instructions to Bidders." City of New Castle vs. Rearic, 18 Pa. Super. Ct. 350.

Sanitation — Dead Animals — Where a city scavenger negligently and repeatedly deposited dead animals, garbage, and other filth on ground near a residence, thereby creating a nuisance, and causing personal discomfort and expense to the inhabitants therein, the city was liable, though the ground was not owned by it, and was not under its control. City of Stephenville vs. Bower et ux., 68 S. W. Rep. (Tex.) 833.

Sewer Construction—In the construction of sewers empting into a river, a city is not required to provide against phenomenal floods which are beyond reasonable anticipation; but it is required to guard against floods such as have occasionally occurred, and which may be reasonably excepted to occur again, and, failing to make such provision, it is liable for the consequences of its negligence. Kansas City vs. King, 68 Pac. Rep. (Kas.) 1093.

Sewer for Private Purposes—The act of a city's board of alderman in directing a sewer to be put in for the mere use of a hotel is ultra vires as concerns the city, and for a nuisance arising therefrom liability may attach to the aldermen individually, but not to the city. Barger vs. city of Hickory, 41 S. E. Rep. (N. C. 708.

Sidewalk Basement—Where a city knowingly allows a boiler to be maintained in a basement attached to a building and located under a sidewalk, without the basement being constructed as required by ordinance, evidence of the injury of a traveler on the street by an explosion is prima facie proof of negligence on the part of the city, and this is true though there was no contractual relation between the traveler and the city. Beall vs. City of Seattle, 69 Pac. Rep. (Wash.) 13.

Tunneling—Nature of Soil—A contract for a city sewer stipulated, "No tunneling unless by consent of board of public works, or unless stated on the diagram," and provided that all loss from constructions should be borne by the contractor. The diagram bore the words "N. B. May be tunneled;" and the contractor and city officers understood that the work would be tunneled. On an attempt to tunnel sand was encountered necessitating the excavation of a trench, whereby the work exceeded the contract price; and the contractor sued on the theory that the city having represented the soil to admit of tunneling, there was an implied obligation to pay the increased cost. Held, that while there was an expectation of tunneling and a permission to do so, there was no representation as claimed by plaintiff. Gartner vs. City of Detroit, 90 N. W. Rep. (Mich.) 690.

CURRENT INFORMATION.

Production and Price of Cement.

The reports to the United States geological survey show a production of Portland cement in the United States in 1901 of 12,711,225 barrels, almost 50 per cent. increase over 1900. The reports are from fifty-six factories. The product of the sixty natural hydraulic cement factories reporting was 7,084,823 barrels, about 1,300,000 barrels less than in 1900. Of slag cement 272,689 barrels were reported, 93,000 barrels less than the previous year. Imports were not quite 1,000,000 barrels of 380 pounds each, less than half those of 1900. The total consumption of cement in the United States in 1901 was 20,573,538 barrels, an increase of 1,300,000 barrels over 1900. The increase in the use of American Portland cement is more than three times that in the total use of cement. The artificial domestic product is rapidly replacing both the natural product and the imported cements.

The prices of cement for several years were given on page 46 of Municipal Engineering for July, 1902. Prices have increased materially within three or four months. At Baltimore the best brands in wood cost $2.25 to $2.50 a barrel and ordinary Portland cement in cloth sacks $1.70 to $1.90, with an upward tendency. At Indianapolis a brand which could be purchased last winter for $1.60 now costs $2.35. Prices at the mills in bulk have increased 50 cents or more. The mills are running with all their available capacity to keep up with the demand, and the present period of stringency will doubtless be soon passed. The increase in the use of cement is, however, still continuing and there is no present prospect of long-continued overproduction.

Forms for Cement Blocks.

The following construction is used by an Ohio contractor in making molds for artificial stone. The base of the mold, on which the outside face of the stone is formed, is a two-inch plank with a sheet iron face. Any desired form of face could

doubtless be provided for by proper molds set on this base plank. The sides are planks about five feet long, giving room for three eighteen-inch blocks. On the inside of these planks are fastened pieces of plank one inch thick, ten inches wide and eighteen inches long with one inch between them in which similar planks across the space are inserted, thus making the division between blocks and the ends of the form. All these planks next the concrete are planed. The exact size of blocks formed is 10 inches by 10½ inches by 18 inches, but evidently any desired size and form can be made. The sides can be held together in any convenient manner, cleats on the base and clamps across the top, stakes down in the ground, etc. The concrete sets in about 24 hours when the stones can be removed and stored for further hardening.

These forms are cheap and convenient, but are likely to warp and to require much cleaning, both of which could be obviated by making them of metal, at some increase in cost.

Municipal Progress.

The forces making for municipal progress are increasing in number and efficiency from year to year, and the more hopeful tone taken by reformers of the outlook is undoubtedly due to this fact. When we recall the fact that ten years ago there was but a handful of municipal reform organizations, and those mostly confined to the Atlantic seaboard, with the possible exception of one or two in Chicago, and that there was not a single national body devoted to the study or the attempt to solve the complicated and difficult municipal problems, we can see the great change and the great progress that has been made. Now there are, roughly speaking, according to the figures of the National Municipal league, 600 local reform bodies, not counting village improvement societies, and five vigorous, aggressive national bodies concerned in various phases of the municipal question.

The Growth of the Gypsum Industry.

Dr. Joseph Struthers of the United States geological survey says that the production of gypsum in the United States during 1901 was 659,659 short tons, valued at $1,577,493, as compared with 594,462 short tons, valued at $1,627,203, in 1900, an increase of 65,197 short tons and a decrease of $45,710 in value. There has been a remarkable increase in the production of gypsum in the United States during recent years. For the ten years prior to 1899, the annual output averaged 269,712 short tons. During 1900 the production rose to 594,462 short tons, and in 1901 to the maximum output of 659,659 short tons. The rapid development of the gypsum industry has risen mainly from two causes: The increased use of plaster of paris in the manufacture of all wall plaster in modern buildings, because of its superiority in harness and durability to lime plaster and the large quantities consumed in the manufacture of "staff" for the construction of temporary buildings, particularly exposition buildings.

The quantity of crude gypsum sold in 1901 was 72,669 short tons, valued at $76,773, as compared with 35,479 short tons, valued at $44,127 in 1900, an increase of approximately 105 per cent. over the production of 1900. The value per ton of the product, however, decreased from $1.24 in 1900, to $1.06 in 1901, the lowest price reported since 1890. Most of the gypsum sold in the crude state is used for land plaster, being ground for this purpose by custom mills.

The quantity of gypsum ground into land plaster during 1901, was 65,698 tons, valued at $123,153, as compared with 45,682 tons, valued at $82,806 in 1900, an increased production of 43.5 per cent. over the figures for 1900. The value per ton was about the same for the two years, averaging in 1900, $1.81, and in 1901, $1.87.

The quantity of gypsum calcined into plaster of paris in 1901 was 521,292 tons, valued at $1,377,570, as compared with 513,301 tons, valued at $1,500,270 in 1900. The value per ton decreased from $3.79 in 1900 to $3.34 in 1901. The value assigned to calcined plaster is for the quantity of plaster produced after calcination, not for the raw material.

The production of gypsum in the United States during the last three years has been derived from seventeen states and territories, and although this mineral occurs in other states the development of the properties has not yet been considered advantageous. The proportion of the total output of gypsum used to produce plaster of paris has risen during the last twelve years from about 58 per cent. to about 80 per cent. in 1901. A noteworthy feature of the gypsum industry during the year has been the consolidation of some twenty-six independent companies in Iowa, Kansas, Michigan, New York and Oklahoma into the United States Gypsum company. In the order of production for 1901, Iowa, Kansas and Texas, grouped together, come first with 213,419 short tons, followed by Michigan, second, with 185,150 short tons, and by New York, third, with 119,565 short tons, the other states following at long intervals.

The imports of gypsum are chiefly from

Canada, the product from the dominion being very pure and well adapted for the manufacture of plaster of paris. The large increase in the production of domestic gypsum has not had any marked influence on the imports of Canadian gypsum. Most of this material is imported in the crude state and calcined into plaster of paris at various points in the New England states, New York and New Jersey. The imports and value of crude or unground plaster in 1901, amounting to 235,204 long tons valued at $238,440, were the largest on record. The decrease in the imports of calcined plaster is worthy of note; for in 1891 they were valued at $97,316 and in 1901 they were worth only $19,627. The total production of Canadian gypsum for 1901 was 293,799 short tons, valued at $340,148, of which 172,010 short tons were exported.

Prizes to City Repair Gangs in New York.

Commissioner of Public Works Redfield of New York City has instituted a money prize system for sewer and street repair and connection gangs. Of $250 appropriated for prizes $150 is to be awarded in the bureau of highways and $100 in the bureau of sewers. Certificates of merit will be issued to the men winning prizes, and a similar certificate, without money, is to be given to each member of the gang making the second best record in repairs or connections. The work is to be done by Oct. 1.

Decline of Chicago Harbor.

In his annual report regarding the improvements of the rivers and harbors of the Chicago district Lieut.-Col. O. H. Ernst makes the following estimates for the fiscal year 1901:

Chicago harbor, $210,000; to complete the project, $457,965. Calumet harbor, $204,480, which will complete the project. Calumet river, $260,000; to complete the project, $423,822. No estimate is made for the Chicago river, there being now available $567,954.

In discussing the effects of making the Chicago river a sewer for the city of Chicago Col. Ernst says that the slope of the river has been changed and this has reduced the depth. The sanitary district has agreed, however, to remedy this defect by dredging. To maintain the river as a navigable channel and a sewer periodical dredging will be necessary. Col. Ernst thinks that, as it is a sewer of the city, the city and not the general government should do the dredging and maintain the channel. The report says that on "the south branch the question has been solved by the necessities of the drainage canal, but the sanitary district has not accepted responsibility for maintaining the other branches. Whether that organization or some other representing the people of Chicago should do the work is for them to decide, but it seems to me clear that the United States should not be called upon to do it. Accordingly no estimate for maintaining the channel excavated under the project of 1896 is submitted."

The balance available will be used for the acquisition of the necessary land and to excavate two turning basins—one on the south branch near its junction with the south and west forks, and the other on the north branch near the head of Goose island.

Col. Ernst says that while the volume of business on the river was slightly larger this year than during the previous year, yet with that exception it was less than any year since 1893. "This decline has been steady," says the report, "and is bound to continue unless the obstructions to navigation in the river are removed. The people of Chicago through the officials of the sanitary district are doing good work in that direction and are engaged in a systematic and extensive system of improvements in the south branch, but will accomplish little without the removal of the tunnels under the river. These tunnels now have about seventeen feet of water over them and limit safe navigation to vessels of sixteen feet draft. The attitude of congress is that they are legal structures until removed by the city of Chicago.

"No lake port which cannot safely accommodate vessels drawing more than sixteen feet can hold its own in these days of deep draft vessels. Chicago will do well to remove the tunnels without further delay if she is to arrest the decay in her lake shipping, which has been going on almost continuously for the last ten years."

He recommends that Calumet harbor be given the same depth of water as provided at Duluth, Cleveland and Buffalo.

Is Cleveland City Council an Illegal Body.

Quo warranto proceedings were begun in the circuit court July 19 to oust the city council of Cleveland, O., demanding that the members show by what right they hold office. Judge Coldwell, in the circuit court, granted an order restraining the council from granting further franchises or special privileges until the case is closed. The petitioners protest that the council has granted a perpetual franchise for natural gas and is consider-

ing the extension and changing of the street railway and telephone franchises without due regard for public interests. Attorney-General Sheets holds inasmuch as the federal plan of municipal government has been declared unconstitutional by the state supreme court, the city council is an illegal body.

Prizes for Anemometer Designs.

The German government has offered prizes of $1,250, $750 and $500 for pressure anemometers. All designs must be submitted by April 15, 1903, to the Deutsche Seewarte, Hamburg, Germany. All nations are invited to compete. The requirements for competition can be obtained gratuitously from the Geheime Registratur D., Ministry of Public Works.

Proposed Steel Track Wagon Road.

Charles M. Schwab, president of the United States Steel corporation, has declared his intention to contribute sufficient specially rolled steel to build a mile of steel track wagon road for the Automobile Club of America. The plans of the A. C. A. provide for parallel grooved tracks of sheet steel in which the wheels of vehicles can run on either side.

Hot Water and Steam Heating Plants in Electric Stations.

At the last meeting of the National Electric Light association the subject of combination of hot water or exhaust steam heating plants with electric light and power stations was considered by three members of the society. Mr. J. F. Porter gave his experience with a hot water heating plant which supplies 50,000 feet of radiation placed in residences, business houses, offices and schools. The plant has been in operation since 1889, and the repairs for the first two years have amounted to less than $400. During these two years the plant was operated without any back pressure on the engines, but owing to increased heating business and the severity of the past winter it was found necessary to weight the back pressure valve from three to five pounds, when there was but little electric light or power load; but during the late afternoon and until midnight there was ample steam to furnish heat without back pressure on the engines. In conclusion, Mr. Porter says that he believes that a hot water heating plant of sufficient capacity to use the exhaust steam of a combination railway and lighting station would prove satisfactory to any operating company.

Mr. P. H. Korst in his paper also gave testimony in favor of the hot water system. The advantage of this system he stated to be the utilization of exhaust steam without putting back pressure on the engines, and that it even enables engines to be run condensing. Mr. Korst said that his customers, after two seasons of use, are highly pleased with the hot water system and recommend it to all inquirers. An objection to charging by the meter system is that customers will thereby be encouraged to keep down the supply, with the result that the system is discredited when the temperature of a house or store is thereby kept low. He considers that the most satisfactory system is to charge according to the cubic contents of the space to be heated, with additions for variations in exposure of walls, etc., and then install enough radiation to keep the rooms comfortable at all times.

Mr. Maunsell gave his experience in the operation for five years of an exhaust steam-heating system at Topeka, Kas. About one-sixth of the total investment if his company is in a steam-heating system, and this has proved a particularly good investment. He considers that the effect of back pressure while operating an exhaust steam-heating system is not such a serious matter as many have been led to believe, and a table is given to sustain this opinion, the table showing the number of hours and the different pounds of pressure on the mains throughout the year. The maximum back pressure is required but a few hours during the heating season of 5,760 hours, or eight months, and during 872 hours no back pressure is required. Steam is supplied by the flat rate or by the meter system. The rates are 30 cents per sq. ft. for direct radiation per season; 35 cents for indirect radiation, and 20 cents for cooling coil. The meter rate is 60 cents per 1,000 lbs. of water. A square foot of radiation is about 3 ft. of 1-in. steam pipe. Indirect radiation consists in placing the piping in such a manner that cold air is passed over it from any source to extract the heat. A cooling coil is necessary to extract the remaining heat from the water before it is discharged to the sewer, as without this device considerable waste of heat would occur.

Municipal Control Retards Electrical Development in England.

A committee of sixteen of the British Institution of Electrical Engineers has had under consideration for a year the hampering of electrical development by municipal obstruction and controlling laws. This has resulted in the use of American and foreign apparatus on some roads, and it often results in the failure of large plans for traction systems cov-

ering large areas on account of the obstructions placed by one or more of the municipal or county authorities in the district. The committee proposes the following set of resolutions or recommendations:

1. That, notwithstanding that our countrymen have been among the first in inventive genius in electrical science, its development in the United Kingdom is in a backward condition, as compared with other countries, in respect of practical application to the industrial and social requirements of the nation.

2. That the cause of such backwardness is largely due to the conditions under which the electrical industry has been carried on in this country, and especially to the restrictive character of the legislation governing the initiation and development of electric power and traction undertakings, and the powers of obstruction granted to local authorities.

3. That local boundaries have usually no reference whatever to the needs of the community in regard to electric supply and traction; that the selection of suitable areas should be dealt with on the basis of economic principles and industrial demands; and that this has been found to apply also to gas, water and sanitary engineering.

4. That the development of electric power and traction undertakings offers the most favorable means of relieving congested centers, and of thus contributing toward the settlement of the housing question.

5. That it is expedient in the national interests that the Electric Lighting Acts 1882-8, the Tramways Act 1870, and the Standing Orders relating to special acts for tramways should be amended in so far as they enable local authorities to veto or delay the carrying out of electric supply and traction projects of which the utility can be shown; and that effect should be given to the recommendations of the Joint Select Committee of Parliament 1898 on "Electrical Energy—Generating Stations and Supply."

6. That excessive time is occupied and expense incurred in obtaining authority to carry out electrical undertakings, and that important and growing industries are thereby checked.

7. That while this committee fully recognizes the ability of the technical officials of the government departments concerned, it is of opinion that the staffs of those departments, as at present existing, are wholly inadequate, having regard to the great industrial interests involved; that it is essential that these departments should be put into a position enabling them to keep in touch with all developments in engineering matters, both in this country and abroad, and that a sufficient sum should be provided annually by the government to enable them to employ and pay a proper staff for such purposes.

8. That the adjustment of departmental regulations to engineering development should not be delayed until the industrial interests concerned are seriously hampered, and that, with a view to preventing any such delay, the Institution of Electrical Engineers should be willing to take part in revising such regulations from time to time.

9. That this committee recommends that the institution should memorialize the prime minister to receive a deputation for the purpose of urging the removal of the present disabilities and restrictions which prevent electrical engineering from making the progress that the national interests demand, and attaining at least the same level as in America, Germany and other industrial countries.

Acetylene Gas Plant in Bellwood, Neb.

In the village of Bellwood, Neb., an acetylene gas plant was installed in December, 1901, which seems to have paid expenses from the first and now to be paying a profit. In the second story is the storage for the carbide which is dumped through the floor into the hoppers of the double generator below. The residuum is run through sludge cocks into a tank underneath the building. The time required to charge the plant with water and carbide for a day is about thirty minutes. The expense is evidently very low. The price charged for gas is $1.50 per hundred cubic feet, equivalent to $1.25 per thousand of ordinary gas if measured in candle powers, since the candle power of the acetylene light is about twelve times that of ordinary gas lights.

Bids for Garbage Collection and Disposal, Newark, N. J.

Bids for the collection and disposal of garbage and refuse materials were received July 17 at Newark, N. J., the contract to commence Jan. 1, 1903, and expire Jan. 1, 1908. The specifications provide for dividing the city into two districts. District No. 1 contains about 1,220 acres and comprises the most populated part. District No. 2 surrounds district No. 1 and comprises about 8,700 acres. The extreme distance to be covered for both districts from north to south is 7½ mis., and from east to west 4 mis. Both districts comprise 124 mis. of paved streets and 104 mis. of unpaved streets. Unless otherwise directed garbage, paper and ashes with rubbish material are to be collected separately, between the hours of 7 a. m. and 6 p. m. Between May 1 and Nov. 1 the garbage in district No. 1 is to be collected once every day, and ashes and rubbish material three times a week on alternate days. Between Nov. 1 and May 1 garbage is to be collected three times a week on alternate days, and ashes and rubbish material once every day. In

district No. 2 garbage between May 1 and Nov. 1 is to be collected four times a week, and ashes and rubbish material twice a week. Between Nov. 1 and May 1 garbage twice a week and ashes and rubbish material four times a week. In the second district the collection will be made on such days of the week as may be fixed by the superintendent of works. No collection of any of the materials is to be made on Sundays. Waste paper will be collected once a week in both districts. All garbage must be in process of destruction either by reduction or cremation, not later than 6 a. m. on the day following its receipt at the plant. The specifications provide that the contractor may deposit the ashes and rubbish material (all waste material except garbage, ashes and paper) at some place or places within the limits of the city of Newark, to be designated by the contractor and approved by the board of street and water commissioners (board of works) or the general superintendent of works.

Ernest Adam, engineer of street and sewer departments, has forwarded a list of the bids received July 17, which were as follows:

	First Year.	Second.	Third.	Fourth.	Fifth.	Total.
*Benjamin Meyer, Newark, N. J...	$ 79,000	$ 81,000	$ 83,000	$ 85,000	$ 87,000	$415,000
Horace J. Subers, New York	80,700	82,300	84,000	85,700	87,500	420,200
Matthew T. Meagher, Brooklyn, N. Y.	88,000	89,000	90,000	91,000	92,000	450,000
The General Industrial and Contracting Co., Newark, N. J....	107,000	108,600	110,380	112,350	114,510	552,840

*The garbage is to be treated by reduction system of Arnold & Edgerton patents. The other proposals did not state in what manner the garbage would be disposed of.

The bid of Benjamin Meyer was the lowest submitted, the total bid for five years being $415,000. An informal bid was submitted by the International Engineering Corporation of Bridgeport, Conn.

The award of contract was deferred.

Burlington, Ia., Cannot Purchase Water Works.

An opinion has been handed down by District Judge Withrow, granting the application for an injunction to restrain the city of Burlington, Ia., from entering into a contract with Hayes & Son of Cleveland, O., for the bonds to purchase the water works. Judge Withrow's decision, in part, is as follows:

The admitted facts in the case are that the defendant is a city of the first class; the taxable value of the property at time of last general state and county assessment was $3,386,308; the present indebtedness is $230,367.

The city by its mayor and council has heretofore advertised for bids for furnishing money to purchase plant of Burlington Water Company and to improve same.

That bonds be issued limited to $400,000, with interest of 4½ per cent. annually, maturing in twenty-five years.

W. J. Hayes & Son bid $360,000 for said bonds, which was accepted. The city of Burlington pleads that it is its intention to borrow by such means an amount necessary to pay the total remaining unpaid cost of the water works, and an amount sufficient to make necessary extensions, the latter being estimated at $80,000. That under the provisions of the ordinance of 1877 the city paid off certain of the water bonds, amounting to $43,000.

It further pleads that only such funds shall be applicable to the payment of said bonds or mortgage as are permitted to be so used under section 749 of the code of Iowa, and that it is its intention to issue its bonds and mortgage the water works plants so purchased to secure the same.

The city also states that in addition to raising the above amounts it also intends to borrow an additional amount not exceeding $500,000.

Section 3 of article 2 of the constitution of the state of Iowa declares that: "No county or other political or municipal corporation shall be allowed to become indebted in any manner or for any purpose to an amount in the aggregate exceeding 5 per cent. on the value of the taxable property within such county or corporation, previous to the incurring of such indebtedness."

The indebtedness of the city of Burlington at present is in excess of the amount limited by the constitution. The limitation of the constitution is against all indebtedness, either express or implied. Litchfield vs. Ballou, 114, U. S. 190; French vs. Burlington, 42 Iowa 614.

It is pleaded by defendants that under the proposed plan the amount the city will be required to pay annually will be less than it now pays for like service and that the ownership will be for the interests of the city. This may be conceded to be true, yet, if the act under which such benefits will arise has in it the vice of being beyond the city power the question of benefits cannot be considered.

Plaintiffs are entitled to injunction as prayed in the first and third clauses of their prayer. Decree will be prepared in accordance with the foregoing findings and this order

Asphalt Bids in Philadelphia.

The city of Philadelphia has just received bids for the paving of about fifteen miles of streets with asphalt, before the expiration of the present year. This action coming simultaneously with the announcement of the asphalt trust plan of

reorganization created considerable interest in asphalt circles. The estimated cost of the work is nearly $1,000,000. Only two companies bid on the work, viz.: the Pennsylvania Asphalt Company and the Vulcanite Paving Company. For new paving the average bids of the two companies were as follows: Vulcanite Company, $2.51 6-10 per square yard; Pennsylvania Asphalt Company, $2.57 4-10 per square yard. Their average bids on 119 items for repaving were: Vulcanite Company, $2.51 6-10 per square yard; Pennsylvania Asphalt Company, $2.52 3-10 per square yard. The awards, however, will be made upon individual items.

The bids of the Vulcanite Company for new paving ranged from $2.54 to $2.59 per square yard, and for repaving, from $2.28 to $2.57; while those of the Pennsylvania company ranged from $2.52 to $2.61 for new paving, and from $2.43 to $2.59 for repaving. The Vulcanite Company promises to furnish Trinidad Lake asphalt, while the other company furnishes Bermudez Lake asphalt, these being the only two kinds allowed under the specifications. By the city ordinance the price per square yard required to be paid to the city by private property-owners for new paving of all kinds in front of their properties, is $2.00 per square yard. Both of the competing companies are in the asphalt trust.

Plan for Reorganization of Asphalt Trust.

The plan of reorganization of the Asphalt Company of America and the National Asphalt Company was made public July 20 by the two committees that have been examining the condition of the companies. The plan provides that the property of the two companies shall be acquired by a new corporation, which is to have a capital of $31,000,000, as follows:

Five per cent. preferred stock, cumulative after the expiration of two years from the purchase of the property and the commencement of business by the new company, entitled to no dividends in excess of 5 per cent., but to be preferred in liquidation to the amount of its par value, together with all accumulative and unpaid dividends, to an amount not exceeding $14,000,000; common stock not exceeding $17,000,000.

The new company may or may not acquire the property and securities formerly belonging to the two companies as may be to the interest of the new company.

All the stock of the new company, except such number of shares as may be reserved to qualify directors, is to be vested in five voting trustees, viz: Rudulph Ellis, William F. Harrity, Alvin W. Krech, Henry Tatnall and George R. Turnbull for ten years who issue certificates of beneficial interest, entitling the registered holders of such certificates to receive stock certificates, and in the meanwhile to receive payments equal to the dividends collected by the voting trustees upon the number of shares therein stated. The shares, however, with the voting power thereon, shall be vested in the voting trustees until the stock shall become deliverable.

Preferred stock will be exchanged for common stock at the rate of $150 in common stock for each $100 of preferred stock surrendered. Of the common stock an amount equal to one-half the preferred stock to be issued and not exceeding $7,000,000 will be set aside in the hands of a trustee or depository to be used only for the conversion of preferred stock into common stock. The common stock until its exchange for preferred stock is to draw no dividends and exercise no voting rights. The preferred stock is to be subject to redemption or purchase at any time after three years from the issue thereof, at the rate of 110 per centum of its par value.

The directors are not to create or authorize any issue of bond or funded debt secured by mortgage, pledge or other lien, on any or all of the property of the corporation, without the consent of the holders with voting power of not less than three-fourths of each class of capital stock and the consent of the holders of not less than three-fourths of each class of voting trust certificates outstanding. The directors can, however, incur or authorize unsecured or floating indebtedness up to 15 per cent. of the amount of the outstanding capital stock without the consent of the shareholders. The voting trustees construe this as not including indebtedness of the various companies to one another or to the new company and the existing indebtedness represented by debentures of the Barber Asphalt Paving Company and the new Trinidad Lake Asphalt Company.

Participation requires deposit of securities in negotiable form, and those who have already deposited under the agreement of Nov. 14, 1901, will be assumed as assenting unless written notice of dissent is received before Aug. 19.

The outstanding certificates of the Asphalt Company of America are to be reduced to about $27,000,000 by exchange for common stock trust certificates of the new company and for preferred stock of the new company at the rate of $500 of preferred stock of the new company for each $1,000 of certificates

Shares to the amount of $4,500,000 of common stock are to be sold for cash at

50 per cent. of their par value. This amount has been underwritten.

Such underwriting and the exchanges of gold certificates of the Asphalt Company of America for stock as next hereinafter provided will be accompanied by an adjustment and satisfaction by the underwriters and holders of such certificates of certain claims of John M. Mack affecting properties acquired by the National Company in exchange for certain amounts of its shares prior to the merger with the American Company.

Stock trust certificates for common stock to the amount of $1,500,000 are to be issued in exchange for certificates of the Asphalt Company of America to the amount in par value of $2,500,000, which certificates are not to be exchanged for preferred stock trust certificates of the new company.

Holders of the certificates of the National Asphalt Company have the privilege of acquiring stock trust certificates for common stock of the new company to an amount not exceeding 40 per centum of the par value of the certificates and on the payment of $4 for each $100 of stock trust certificates to be acquired.

Holders of preferred stock of the National Asphalt company have the privilege of acquiring stock trust certificates for common stock of the new company to an amount not exceeding 11 per centum at the par value of the preferred stock and on payment of $4 for each $100 of stock trust certificates to be acquired.

Holders of common stock of the National Asphalt Company have the privilege of acquiring stock trust certificates for common stock of the new company to an amount not exceeding 4 per cent. of the par value of the common stock and on payment of $4 for each $100 of stock trust certificates so acquired.

The stock trust certificates not required for these purposes may be used for the purposes of the two committees or of the New Company; and common stock trust certificates to an amount not exceeding $200,000 in par value may be used for the compromise of the claims of Adolphus Busch of St. Louis, Mo., and his associates upon the preferred and common stock of the Gilson Asphaltum Company of New Jersey, now constituting part of the assets of the National Asphalt Company.

The committees can use the stock of the New Company, or stock trust certificates not required for purposes set forth, for the expenses of the organization and other purposes nesessary to enable them to carry out the plan of reorganization, and to sell or otherwise dispose of such stocks or stock trust certificates, or to procure such sales to be underwritten, upon such terms and conditions and at such rates as they shall deem proper.

Deposit of securities or failure to dissent by holders who have already deposited places the title with all rights and claims in the hands of the committee, which can hold them or extinguish them, and no liability or trust in favor or in respect of the owners or holders of such rights or claims is constituted. Funds may be procured by loans on terms deemed proper by the committee pledging all stocks or certificates, new or old, as security.

The committees employ counsel, agents and all necessary assistants and incur any expenses by them deemed reasonable. No member of either committee is personsonally liable in any case for the acts of any other, nor for the acts of their agents or employes. The committees may construe this plan and their construction thereof or action thereunder, in good faith, shall be final and conclusive. They may supply any defect or omission or reconcile any inconsistency in such manner and to such extent as shall be necessary to carry out the same properly and effectively, and they shall be the sole judges of such necessity. The members of the committees or any of them may be or become pecuniarily interested in any of the properties, securities or debts which are the subject of this plan, and they shall be allowed their expenses for counsel fees and otherwise and a reasonable compensation for their services, to be fixed by themselves. Within one year after the organization of the new company the committees shall file their accounts with the board of directors of the new company. Such accounts shall be binding and conclusive upon all parties hereto, unless objection be taken thereto by such board of directors within thirty (30) days thereafter.

This plan of reorganization may be declared operative by the two committees whenever, in their judgment, a sufficient number of securities shall have been deposited to make it practicable. Either before or after declaring said plan operative the committees may either modify or amend, or they may abandon the execution of the plan and return all securities; and any certificate-holder may, within two weeks after the expiration of published notice, but at no time thereafter, dissent from such modified or amended plan, and within ten days thereafter may withdraw, without expense, from the depositaries his certificates or shares. In the absence, however, of such

expressed dissent, in writing, the holder of a certificate of deposit shall be conclusively presumed to have assented to and ratified such amendment or modification of the plan and shall be bound by all of the provisions thereof; and the committees may proceed to carry such modified or amended plan into execution on behalf of the assenting interests.

Accompanying the reorganization plan were the separate reports of the two committees to their respective security holders. The National committee quotes from a letter of Receivers Henry Tatnall and John M. Mack in which they say the new company should have an annual income of approximately $700,000 a year.

The American committee goes into detail of the combination of companies, the general result being shown in the following table:

TABLE SHOWING TERMS OF MERGER OF COMPANIES.

Name of Company.	Total No. of Shares.	Shares Par Value.	Shares Purchased.	Price Paid.	Cost in Cash.	Cost in Certificates.
Barber Asphalt Paving Company...	39,000	$100.00	38,993	$ 300.00	.....	$11,697,900.00
The New Trinidad Lake Asphalt Co.	50,000	48.50	49,550	100.00	$4,244.32	4,955,000.00
Alcatraz Co. of West Virginia.....	800,000	5.00	799,900	6.00	.....	4,799,400.00
United Asphalt Co.....	40,000	100.00	39,975	91.808	.....	3,670,000.00
Atlantic Alcatraz Asphalt Co.....	1,000	100.00	995	1,000.00	.....	995,000.00
Southern Asphalt Paving Co.....	250	100.00	245	1,020.00	.....	249,900.00
Alcatraz Paving Co.....	1,000	50.00	995	500.00	.....	497,500.00
Alcatraz Asphalt Paving Co.....	1,000	100.00	995	150.00	.....	149,250.00
Warren-Scharf Asphalt Paving Co.	9,500	100.00	9,493	240.00	5,618.42	2,278,320.00
Utica Paving Co.....	250	100.00	245	510.21	.....	125,001.45
Denver Paving Co.....	35,000	1.00	34,950	5.714	.....	199,714.09
S. W. Alcatraz Asphalt & Con. Co..	2,000	100.00	1,995	64.16	.....	127,999.26
Alcatraz Construction Co.....	1,500	100.00	1,495	104.31	.....	155,943.45
There were also certain other purchases made from other parties, the cost of these to the Asphalt Company of America in cash and the number of shares acquired being as follows, viz.:						
Western Paving and Supply Co. of Wisconsin	600	$100.00	463)		($75,950.00	
West. Paving & Sup. Co. of Illinois.	1,000	100.00	1,000)	164.047	(164,050.00	
Richardson & Ross Asphalt Paving Co.....	2,000	100.00	2,000	189.313	378,627.30	
Pittsburg Asphalt Paving Co.....	2,750	100.00	2,700	189,776	512,396.87	
New Jersey Asphalt Co.....	179	100.00	132	79,620	10,509.89	
Grant Paving Co.....	750	100.00	555	93,525	51,906.28	
Franklin Oil Co.....	250	100.00	174	79,806	13,886.22	
American Oil and Asphalt Co.....	5,000	100.00	5,000	6,116	30,581.74	
Bermudez Asphalt Paving Co.....	500	100.00	500	227	113,500.00	
Indiana Bermudez Asphalt Co.....	480	50.00	480	125	60,000.00	
Central Bermudez Co.....	480	50.00	480	178,735	85,792.97	
Later it was decided to merge these 11 companies into a holding company organized for that purpose, to-wit:						
Consolidated Paving Company (par $100.00—$1,500,000)					2,798.73	
					$1,509,862.74	$29,900,928.19
						1,509,862.74
						$31,410,790.93
Note—$148,000 of the bonds issued in payment for these properties appear to have been subsequently returned to the Asphalt Company of America, but on account of what purchase the Audit Company of New York has been unable to ascertain. Your committee is informed, however, that these bonds were issued in the expectation of acquiring another property, but that the transaction fell through and the bonds were returned.						
It would further appear that..... was credited to profit and loss account in the year 1900 by the Asphalt Company of America on account of the return of these bonds, but this item was not allowed by the Audit Company of New York in the adjustment of profits for that year, being considered as a reduction in the cost of the properties, making the total cost of the properties so acquired in cash and bonds.....						105,875.00
						$31,304,915 93

PROFITS AND LOSSES OF COMPANIES IN 1900 AND 1901.

	Loss.	Profit.	
Barber group		$751,699	
New Trinidad		79,877	
Alcatraz group $333,068			
United Asphalt		43,919	
Consolidated Paving 45,862			
Net profit on five groups.....			$496,565
Other profits Asphalt of America ..			218,714
			$715,279
National Asphalt Company, loss ..			17,103
Profits for two years.....			$698,176

No allowance is here made for the $3,000,000 interest and the sinking fund.

The companies of the large table are combined into groups in the small table.

In its conclusions the committee states

that it has been advised by counsel that it is neither within its province nor power to undertake litigation against the promoters and managers of various sub companies and, irrespective of that, the committee believes that the best commercial results are to be obtained by an amicable adjustment, such as the underwriting of the common shares in the proposed organization. It is urged that it is essential to actively maintain the business; that litigation would be uncertain, expensive and tedious; that delays would cause disintegration to the business; that the business requires fresh capital and that in the opinion of the receivers the plan provides for sufficient working capital to continue the business of the company on its present or a broader basis.

While the plan seems to have met with general favor among the bondholders it has been attacked from several quarters. One litigant, Hannah V. Gallagher, has brought action against the "Biddle" reorganization committee asserting that the plan of reorganization is not a lawful exercise of the powers conferred on the committee and the court is asked to enjoin the proposed issue of stock in the new company. She asks that the payment of $2,250,000 on $4,500,000 of the new company's stock trust certificates be decreed only a payment on account and that the said stock be assessable at its par value and for numerous other rulings from the court calculated to compel the reorganization committees to divulge their plan of action in more detail and to restrict them in the manipulation of the affairs of the companies involved.

The most important step yet taken to frustrate the objects sought after by the reorganizers was the circulation of a letter on July 24 by William C. Bullitt of Philadelphia, Pa., to the minority certificate holders who have objected from the start to the proposed plan of reorganization. After reviewing the alleged weaknesses and injustice of certain parts of the committee's plan, Mr. Bullitt's letter says:

I intend, therefore, to seek redress for the losses sustained by certificate holders by proceeding to have the court enforce the liability for the unpaid 80 per cent. of the Asphalt Company of America stock; the liability on the National Asphalt Company stock issued without adequate consideration as "full paid;" the various liabilities of the promoters of the Asphalt Company of America, and the liability of the officers and directors of the Asphalt Company of America and the National Asphalt Company on account of false statements, written or verbal, as to the earnings of these companies. In the event of an adverse decision I shall, if appeal can be taken, carry the matter to the court of last resort.

John Douglass Brown, jr., counsel of Mr. Bullitt, said it would be some days before the suit would be ready. He declined to outline his plan of attack.

Technical Meetings.

The New England Water Works Association will hold its annual convention in Boston Sept. 10 to 12.

The state good roads convention will be held at Lexington, Ky., Oct. 21 and 22.

The annual meeting of the Michigan League of Municipalities was held at Owosso, Mich., June 25 and 26. Among the papers read were the following: "General and Special Municipal Acts," Prof. John A. Fairlie of University of Michigan; "Non-Partisan Government for Municipalities," Mayor Bible of Ionia; "Sewers," S. J. Wilson of Flint; "Home Rule for Cities," the Hon. George R. Perry of Grand Rapids; "Influences Governing Sanitary Condition of Cities," Dr. J. O. Parker of Owosso; "Villages," Dr. A. R. Ingram of Fenton; "Is a Non-Paid Board of Public Works for the Best Interests of Small Cities?" G. H. Phillips of Battle Creek; "The Duties of City Officers," the Rev. C. H. Hanks of Owosso; "Municipal Affairs," ex-Mayor S. D. Emery; "Some of the Trials and Duties of a Municipal Meeting," Judge S. F. Smith.

The seventh annual convention of the International Association of Municipal Electricians will be held at Richmond, Va., Oct. 7, 8 and 9.

The League of American Municipalities will hold its sixth annual convention in Grand Rapids, Mich., Aug. 27, 28 and 29. John MacVicar, secretary, Des Moines, Ia.

The New Water Supply Contract at San Antonio, Tex.

The present contract of the city of San Antonio, Tex., with the water works company for public and domestic water service expires in August, 1903. Its franchise extends to 1943, and its charter from the state to 1933. The city claims the right to regulate the rates which the company may charge for water service, and has been trying for some time to secure a new contract before the expiration of the present one. On account of failure to agree both parties called upon Chester B. Davis to report upon the value of the works, a schedule of rates and a form of contract. Mr. Davis's report

was recently presented and the contract proposed was signed by the city and the water company on June 13, 1902. The following are some of the provisions of the contract, the omissions being only in matters of legal form and the less important details.

First. The Water Works Company agrees to furnish to the city of San Antonio, for the period ending 1912, such water as may be required for all public purposes for the use of said city, including public parks, public buildings, sprinkling or flushing of streets, flushing of sewers by tanks so arranged as not to empty more than twice in twenty-four (24) hours; provided that dead ends of sewers may be flushed with hose; and including the present fire hydrants and the additional hydrants to be placed under this contract; excepting, however, water used for the purpose of creating power and for ornamental fountains, and excepting also water to be used by private consumers, for the sum of two thousand dollars ($2,000.00) per month, payable as hereinafter stipulated; provided, however, that the exception of water for power purposes shall not exclude the city from the right to use water for the elevator in the City Hall.

Third. The city grants to the Water Works Company the right to supply water to private consumers upon the terms and at the rates hereinafter established; and fixes the rates and terms of water supply to private consumers upon such terms and at such rates during the term of this contract. Provided, that the city especially reserves such right as is given it by section forty-six (46) of the revised city charter, to regulate by ordinance the rates and prices to be charged by the Water Works Company for water during the continuance of this contract; such regulations, however, to be construed as an annulment of this contract within the meaning of that word heretofore used herein, if the rates fixed are reduced; except as to sections eleven (11) and fourteen (14), which can not be annulled.

Fourth. Eight-inch minimum size of pipe and six-inch hydrant branches in fire limits, six and four-inch, respectively, outside; cross connections each 3,000 feet or less; hydrants each 250 feet within fire limits and 500 feet outside; city can have intermediate hydrants set at its own expense without increase in payments to water company; two hose connections to each hydrant and steamer nozzles in high district; extensions of water mains as ordered by the City Council after five consumers have paid for water service for not less than one year, or have deposited the pay therefor with the City Clerk of said city, along each five hundred feet of said extension; main less than six inches to be replaced by new main of ample capacity, without delay, upon the order of the City Council of said city, not exceeding fifteen thousand (15,000) feet during any one year.

Fifth. Pipe to be laid, 1,200 feet a month with penalty of 10 cents a foot per month if not laid, with regulations as to grades of streets and changes of grade, expenses of the latter being paid by the city.

Sixth. Seventy-five gallons per capita per day to be furnished at 75 pounds pressure ordinary and 90 pounds fire at the works, and the reservoir to be kept three-fourths full, under penalty of $100 fer each failure not due to unavoidable accident or repair in progress.

Seventh. The company agrees always to supply water for all purposes, excepting for power uses and for irrigation to consumers, who furnish and lay suitable and durable pipes to its mains and pay the actual cost of connection therewith, at the rates fixed, payable quarterly, excepting meter accounts, which are payable monthly. The company may insert meters where consumers use, or allow the use of, water for purposes for which they have not contracted and have not paid, or where waste of water exists. The company is given the right to inspect premises, by a proper representative, and to shut off water until such improper use, or the waste, is remedied; or to insert a meter and charge meter rates for the service, as is herein provided, and $1 for such shutting off and for turning the water on again.

Eighth. Fixes the annual rates, and has the following provisions for meter rates in residences: Minimum charge 66 cents a month, allowing 4,400 gallons a month, with 14 cents per 100 gallons on additional use; for undue waste in lawn sprinkling the company may insert a meter by which all water used on the premises may be measured, and the minimum charges for all domestic uses and for one thousand square feet of lawn sprinkled shall be $1 per month, which minimum charge shall entitle the consumer to the above volume of 4,400 gallons for house uses and 2,250 gallons monthly for sprinkling purposes, or a total of 6,650 gallons monthly for both purposes. This is equivalent to a combined meter rate of substantially 15 cents per 1,000 gallons. For all water taken in excess of these amounts, a rate of 1.4 cents for each 100 gallons and the fraction thereof may be charged. Commercial meter rates are fixed, varying from 2.5 cents per 100 for 200 gallons a day to 0.9 cents per 100 for over 7,000 gallons a day.

Ninth—It is further agreed that upon making the payment for water for household and domestic purposes above provided each water taker shall have the right to use, and shall be furnished at the company's mains, sufficient water to flush one water closet free of extra charge, so long as he pays for the use of water from the said water works company's mains, and such water closet is connected with the city sewerage system. Provided, that the said water taker shall keep all fixtures in good condition; and if such water taker shall allow water to waste, or use it for other purposes, or refuse to permit an inspection of his premises, or fails or refuses to repair at his own expense any defective fixtures within forty-eight (48) hours after being notified to do so, the water works company may cut off the water supply from such premises until such repairs are made.

Tenth—When a sanitary inspector of said city may report to the city council that the occupant of any house is not a water taker and is unable to pay for water, then the water works company, if ordered to do so by the city council, shall furnish to the city, for a term not to exceed one year, water to flush one water closet, if said water closet is used on said premises and is connected with the city sewerage system, the water so furnished to be a portion of the water agreed to be furnished by the water works company to the city of San Antonio for "public purposes;" and said city council, upon further report of said sanitary inspector of the continuance of the facts upon which said order was made, may, at the end of the time specified in said order, renew said order, and the water works company is to comply with said renewal, and any subsequent renewals thereof, as in the first instance.

Eleventh. No charge to city for flushing sewers, water closets as designated in Section 9, except the $2,000 monthly rental.

Twelfth. No exclusive privilege is granted to the Water Company, nor is right to fix rates withdrawn.

Thirteenth. City furnishes pipes and fixtures for its connections with mains, but has right to designate and use certain hydrants to obtain water for street sprinkling.

Fourteenth. Grants the company the right to use the streets for its purposes and supply water for private purposes not beyond 1943, subject to additional contract when present contract expires; also to construct an oil pipe line for its own fuel, subject to same conditions as other oil pipe line companies, of which map must be furnished to city engineer.

Fifteenth. Former contract reaffirmed.

Sixteenth. Hydrant locations may be changed at city's expense.

Seventeenth. All dead ends must be connected at the rate of 5,000 feet of pipe laid per year.

Eighteenth. Special contracts with consumers are not affected by this contract and table of rates.

Nineteenth. The city can purchase the works at any time at a price to be agreed upon.

Twentieth. A map of the system to be supplied within ninety days to the city engineer and monthly reports of changes to be made.

Twenty-first. Ordinances protecting the works will be passed by the city as desired.

Proposed Increase in Washington Filter Plants.

Col. A. M. Miller, in charge of the Washington aqueduct, sent to the chief of engineers of the army July 3 his project for the completion of the filtration plant. This contemplates a plant for filtering 75,000,000 gallons of water daily. The first report of Col. Miller stated that the plant provided for 60,000,000 gallons daily, but the consumption of water in the district is so great that it was deemed advisable to provide for filtering all of the water that could flow through the existing conduits.

Electric Power from Chicago Drainage Canal.

A plan for the development of power from the flow of water in the drainage canal is being devised by City Electrician Ellicott, who believes that it can be converted into electricity for the operation of the lighting and water pumping plants of Chicago. He estimates the cost of installing the plant at $2,500,000.

Watertown, S. D., Can Assess Cost of Sewer on Property.

The supreme court of South Dakota has handed down an opinion in the suit of Edward W. Heyler and others against the city of Watertown. The council ordered in July, 1901, the extension of the sewer in the East Watertown addition, the cost of construction to be charged to the owners of abutting property. The majority of the property-owners did not want the sewer extended and made a fight on the ground that the city, having a special charter, could not construct a sewer, assessing the cost to the property-owners, when a majority of them did not want it. The residents brought suit against the city to enjoin it from constructing the sewer. Judge Bennett granted a tempo-

rary restraining order and at a special term of court held by him the city entered a general demurrer to the complaint of the plaintiff which the court sustained. He also held that the city had shown sufficient cause why the injunction should be dissolved and ordered that the action be dismissed. The plaintiff filed a notice of intention to appeal. The decision handed down by the supreme court affirms that of the lower court and sustains the city.

Valid Protests Against Liquor Licenses in Massachusetts.

Under the law of Massachusetts applications for liquor licenses have to be publicly advertised. Adjoining owners of real estate may enter protest, if they so elect, to the effect that such licensed place be established not nearer than twenty-five feet from the line of the property of the objector. Judge Gallagher recently granted a petition for the revocation of the first-class liquor license granted certain persons in business at 29 Blossom-st., in Fitchburg, Mass. The court sustains the point that the owner of real estate on the opposite side of a street from a place licensed to sell liquor to be drunk on the premises can legally object, providing that under his deed he owns to the middle of the street and the middle of the street is within twenty-five feet of the licensed premises. The case in which the decision was rendered was an unusual one and the decision, therefore, a new one. In the state of Massachusetts the easement of title to street localities varies according to the terms of the release and in the old days there was great variation.

Suit for Infringement of Patent on Gas Lamp.

A decision was rendered by Judge Bradford in the United States circuit court July 21, at Wilmington, Del., in the case of the Pennsylvania Globe Gas Light Company vs. the American Lighting Company, Ltd., in which he denied the application for a preliminary injunction. The suit was filed June 26, when a restraining order was granted. Judge Bradford's decision was as follows:

The bill in this case charges infringement of letters patent of the United States, No. 31,745, dated Oct. 31, 1899, granted to Arthur E. Shaw and Edward S. Sanderson, assignors to the complainant, for a design for a street lamp, and prays for an injunction and damages. The case is now before the court on a motion for a preliminary injunction. The affidavits on each side are numerous, and it is admitted that there has been no adjudication of the validity of the patent. On careful consideration of all the affidavits and exhibits produced, and in view of the course and practice of the courts in this and other circuits on applications for preliminary injunctions in patent causes, I am satisfied that it would be premature and improper at this stage of the case to express any opinion upon its merits, and that the same should be determined only after plenary proofs shall have been adduced. The application for a preliminary injunction must, therefore, be denied, the costs to abide the event of the cause.

Protest Against Rate for Gas Lamps in Washington.

H. B. F. McFarland, president of the board of district commissioners, has written to S. Calvert Ford, the United States inspector for gas and meters, asking him to keep close watch on the quality of the gas during the present fiscal year and to advise the commissioners from time to time as to how matters are going under the provisions of the new District appropriation bill. The gas company has protested against the provision in the District bill that the maximum rate for street gas lamps shall be $20 per year per lamp, including the cost of construction, repair, etc. The company claims that it costs more than $21 to erect new gas lamps alone.

Proposed Settlement of Lyons Paving Case.

An opinion was handed down in the United States district court, at Dubuque, Ia., July 11, by Judge O. P. Shiras, in the Lyons paving case. In May, 1894, the city of Lyons ordered Sixth-st., known as paving district No. 3, paved. This street would be an extension of Second st., in Clinton, to Main-st., in Lyons, being the principal thoroughfare between the business center in Clinton and the business center in Lyons. The city of Lyons issued city bonds to the amount of $40,000 to pay for the paving. The bonds were sold to Farson, Leach & Co. of Chicago, who, in turn, sold the bonds to the Burlington Savings bank of Burlington, Vt. In 1895 suit was brought by the property-owners to enjoin the city from the collection of the paving tax. The injunction was granted. The case was appealed to the supreme court, and the decision of Judge P. B. Wolfe of the district court was sustained. After this the bondholders importuned two legislatures to pass a law for reassessment, but they were defeated in both legislatures. The bondholders then commenced an action in the federal court to enforce their claim against the city on the ground of tort; also, on the ground of contract upon bond; also, asking that the city be required to levy a proper and

efficient assesment to liquidate the $40,000 bonds and about eight years' interest.

Judge Shiras held that the city was liable for the entire amount of said bonds and interest thereon, amounting to about $60,000, but that on account of the constitutional prohibition of indebtedness limiting the indebtedness of municipality to 5 per cent. of the taxable property as shown by the last tax record, this limited the recovery on contract to about $11,000 as of date May 5, 1894, and the interest thereon to the present date, making about $16,405, which the city would be adjudged to pay without regard to the question of liability on tort. Judge Shiras outlined a settlement, which he believed just and equitable, by all the parties concerned, including the city street railway company and property-owners. The settlement outlined provides that the owners of the bonds receive the principal sum paid by them eight years ago, deducting therefrom all the moneys that they had received from the city either from intersection bonds or otherwise. This left about $28,500 to be paid them, as about $10,000 has already been received. The city's liability of $16,405 leaves a balance, therefore, of $12,000 for property owners and the State Electric Company.

Nashville Street Railway Consolidation Void.

A decision was rendered in the court of appeals at Nashville, Tenn., July 11, by Judge M. M. Neal, declaring void the street railway consolidation of Jan. 23, 1900. The charter rights of the old companies are held to be good. In 1898 a syndicate, known as the Baltimore syndicate, was formed for the purpose of buying three railway systems, at that time operating in Nashville—the Nashville street railway, the Nashville and Suburban Railway Company and the Citizens' Rapid Transit Company. This syndicate bought in three-fourths of the stock of the first-named company and all of the stock of the other two companies. It then caused a charter to be taken out for a new company under the name of the Nashville railway, this company being organized for the purpose of taking an assignment of all the rights which the syndicate had acquired, according to legal forms, for the purchase of the other three companies. On June 17, 1899, this purpose culminated in the purchase contemplated, lacking only one element, the consent of the city. Through a resolution introduced into the city council June 17, 1899, an attempt was made to get the consent of the city. This resolution was withdrawn, however, before being put upon final passage. An ordinance was then introduced on the same subject, known as No. 58, which was substantially the same as the one withdrawn. This ordinance was passed, but was vetoed by the mayor. When the ordinance was returned to the city council by the mayor with his veto certain citizens, fearing it would be passed over the mayor's veto, filed a bill in the chancery court to enjoin the city council from so doing. The motive for the injunction was heard before Judge Anderson, and he, while denying the injunction in the terms asked for, granted a modified injunction, merely restraining the street railway companies from accepting the ordinance if it should be passed. A motion was subsequently made before Judge Cook for a dissolution of the injunction, and after hearing argument of council, he dissolved the injunction, and thereupon the railway companies accepted the ordinance which in the meantime had passed the council over the mayor's veto. The city, therefore, filed bills against each one of the companies, asking that the charters be forfeited; that they be placed in the hands of a receiver; that their properties be sold and their business wound up.

The court's decision leaves the companies where they were before the Baltimore syndicate took hold of them. They cannot consolidate without the consent of the city. The city and the companies are now open to negotiations with each other. The city has the right to recover from the companies any sums it has expended in paving between the tracks and two feet on either side. If the higher court sustains the action of the court of appeals any new consolidation will have to be in the form of a purchase such as is contemplated by law, and will have to be done with the consent of the city.

Proposed Sliding Scale of Payments for Paving by Street Railway Company.

A sliding scale in paying for paving is suggested in the proposed street railway franchise at Traverse City, Mich. The plan proposed provides that the T. C., P. & O. M. R. R. Co. be required to pay but 5 per cent. each year of the whole cost of paving any street on which their tracks may be laid for five years, then to increase 1 per cent. yearly up to ten years; provided, however, that when the city has a population of 15,000 the company shall pay 15 per cent.; with a population of 20,000, 20 per cent.; when the poppulation reaches 25,000 the company shall be required to pave between the rails and for one foot outside the rails.

Tests of Reinforced Concrete Beams.

Prof. W. K. Hatt has recently made some tests of reinforced concrete beams, which he reported to the American section of the International Association for Testing Materials. Part of his paper giving his methods and results follows:

These tests include observations of the load-deflection curve for beams of broken stone concrete reinforced with 1 per cent. and 2 per cent. of wrought iron (more exactly 601-640 and 1202-640 per cent.) located at different positions in the cross-section of the beam. A few tests on gravel and cinder concrete beams are added. Accompanying the tests of flexures is a determination of the following elements: Moduli of elasticity and strength, in tension and compression, of the broken stone concrete; the strength of the cement in tension and compression; the elastic limit and modulus of elasticity of the iron; analysis of the sand and stone; tests of the adhesion between the iron and the concrete.

Materials—(1) Cement. The cement used was Peninsular brand of Portland cement made from marl and clay at Jackson, Mich. The strength of the cement was in pounds per square inch, as follows:

Table I.—Tensile Strength of Cement.

	24 hrs.	7 days.	1 month.	3 months.
Neat	546	803	...	802
3 :1	78	412	505	626
Compressional Strength; 2-in. Cubes.				
Neat 2,402		7,357	9,557	9,740
3 :1	610	3,145	5,860	8,005
Ratio of Compressional to Tensile Strength.				
Neat	6.94	9.13	...	12.14
3 :1	7.82	7.65	11.60	12.78

It was slow-setting, ground to allow 98 per cent. to pass a No. 100 sieve, and withstood the boiling test.

(2) Broken Stone. Broken stone was limestone; the entire product of the crusher was used. The analysis of the stone was as follows: 75 per cent. was retained on a ¼-inch sieve; all passed through a 1-inch sieve.

(3) Sand. The sand used was clean, sharp pit sand of which 48 per cent. was retained on a No. 30 sieve, and 20 per cent. was retained on a No. 20 sieve.

(4) Gravel. The gravel used was good quality coarse gravel.

(5) Cinders. The cinder used was that of bituminous coal, taken directly from the cinder pile and contained about 50 per cent. fine ash.

Mixing, Molding and Storage.—The cement and sand were thoroughly mixed in a dry condition; and then the water was applied; then the broken stone was added to the mortar and the whole thoroughly mixed.

The concrete was fairly dry concrete intended to be plastic after a thorough ramming. About 5.5 per cent., by weight, of water was added. Some of the specimens were more wet than others; these facts are noted in the individual cases in Table VI. The specimens were stored in dry sand and the rate of hardening was rather more rapid than that to be expected in the case of a cement walk. The specimens were taken from the molds as soon as they could be handled without danger of breakage. This period was 24 to 28 hours in case of the beams made in the early spring and 12 to 24 hours in case of beams made at a later period.

Specimens—The compression tests were made on cylinders 8 inches in diameter and 12 inches high. The tension tests were made on bars of square section 4 inches on the side. These specimens were not well designed since the heads pulled off before rupture occurred in the body of the bar. The tension tests included both plain bars and reinforced bars. Wooden moulds were used for these specimens.

The beams were 8 inches square and 80 inches between supports. The steel mould for these beams was built up of two channels and a bottom plate.

The adhesion between the iron and concrete was determined by observing the load necessary to pull iron rods out of 6-inch cubes of concrete.

Methods of Test—(a) Compression. Tests were made on both plain cylinders and cylinders reinforced with rods parallel to the axes of the cylinders. The tests on these reinforced specimens are not quoted below. These reinforced cylinders were weaker than the plain cylinders, and the forms of rupture are abnormal. The shortening of all the cylinders was observed at three points around the circumference by means of hook micrometers attached to a lower steel ring and having contact with an upper steel ring, the gauge length being about 6½ inches. The contact was noted by means of an electric current and the micrometers read 1-1,000 inch and estimated to 1-10,000 inch. These tests were satisfactory.

(b) Tension Tests. The extensions of the tension bars were read on hook micrometers attached to an upper yoke and having contact with fine wires fixed by plaster of paris to the specimen at the lower end of the gauge length. The contact was made known by the passage of the electric current; the gauge length was about 17½ inches.

These tension tests were not satisfactory in that as noted above the heads of the bars, with some exceptions, pulled off except in case of reinforced tension specimens. It is believed, however, by the writer that the strength of the body of the bars was not different from the loads recorded at the point of rupture of the heads. The strength of the reinforced bars which broke in the body was nearly the same as that of the plain bars which broke in the head, viz., about 300 pounds per square inch. The stress-strain diagrams obtained in case of the reinforced bars are important element of the tests.

(c) Flexure. The beams were simply supported at the ends and loaded with a center load. The deflections were read at the middle of the span on both sides of the beam from hook micrometers attached to the beam and making electric contact with wires stretched between points directly over the supporting knife edges and four inches above the latter.

In the three kinds of tests mentioned, loads were applied by increments, and the deformations noted. The loads were released at intervals in order to obtain the set.

(d) Results. (1) Flexure Tests. Notes on condition of concrete and on rupture of beams are given in Table VI.

TABLE II.—MODULI OF ELASTICITY.

Values for Tension.

No.	Kind.	Age, days.	E, lbs. per sq. in.	Elong. at rupt., 1 part in.	Strength, lbs. per sq. in.	Where broken.
1	1:2:4 Stone	35	2,700,000	11,660	300	Pin
2	"	33	2,400,000	8,750	305	"
3	"	28	1,400,000	4,400	360	"
4	"	26	1,900,000	7,700	280	"
.....	Average, plain	.....	2,100,000	7,000	311	.....
5	1:2:4 Reinf.* 1% of iron	28	.....	910	281	Body
6	"	26	.....	1,310	313	"
.....	Average, reinf	.....	.....	1,140	297	.....
7	1:2:4 Cinder	.....	.....	.....	82	Body

Compression.

No.	Kind.	Age, days.	E, lbs. per sq. in.	E measured at stress of	Comp. strength, lbs. per. sq. in.
1	1:2:4 Stone	9	4,702,000	750	2,880
1	"	9	3,940,000	1,500	2,880
2	"	14	4,340,000	750	2,575
2	"	14	3,680,000	1,500	2,575
3	1:2:4 Cinder	9	558,600	.....	495
4	"	9	553,000	.....	595
5	"	7	630,000	.....	412
6	1:5 Gravel	6	2,088,000	.....	1,185

$n = Ec \frac{\cdot}{\cdot} Et = 2.17$ at 750 for point A
$n = Ec \frac{\cdot}{\cdot} Et = 12.8$ at 1,500 for crack. } Stone concrete.

*Values for reinforced bars have not been corrected for the stress in the iron.

(2) Compression and Tension Tests. Table II gives the results of the compression and tension tests. The modulus of elasticity is computed with regard to the set experienced after previous loads. The stress quoted in case of reinforced concrete bars in tension is not corrected for the amount of the load carried by the reinforcement.

(3) Tests of Adhesion. Table III gives adhesion of round steel rods inserted in cubes of concrete.

The values of adhesion represent the ultimate resistance in pounds per square inch of the surface of the rod nominally in contact with the concrete, against a direct tension. Sliding friction, after the adhesion was overcome, was from 50 to 70 per cent. of the adhesion. In many cases the concrete cubes were broken with a hammer after the test in order to determine the uniformity of the contact between the iron and the mortar. This contact obtained only in part, and was irregularly distributed over the surface of the rod.

TABLE III.—ADHESION OF STEEL AND CONCRETE.

Size rod.	Age days.	Depth of rod in concrete.	No of tests.	Adhesion, lbs. per sq. in. of surface of rod.		
				Max.	Min.	Aver.
7-16"	32	6.0"	3	735	470	636
5-8"	35	6.4"	3	780	714	756

(4) Tests of Iron. The metal used was common wrought iron rods, 7-16 and ⅝-inch in diameter respectively. The iron had a yield point of 36,000 pounds per square inch, and a modulus of elasticity of 29,000,000 pounds per square inch.

Analysis of Results—(1) The Nature of the Load Deformation Diagram of Reinforced Concrete Beams. The diagram is nearly a straight line up to a load of from 1,500 to 3,000 pounds in the various beams tested. At higher loads the de-

flection increases more rapidly. However, the diagram again becomes nearly a straight line, the deflection then increasing uniformly with the load until at a load of from 4,000 to 10,000 pounds, a crack occurs in the concrete at the lower face of the beam. Beyond this point the deflection still increases uniformly with the load until the iron reinforcement reaches its elastic limit, at which time the deflection increases rapidly without any corresponding increase of load. These remarks refer mainly to the broken stone beams one month old.

The three characteristic points of a flexure test are: The somewhat indefinite point where the curve first turns from the straight line; the point of first crack of the concrete; and the point at which the elastic limit of the reinforcing metal is reached.

Table IV is a summary of the facts of the test of the series of concrete beams

TABLE IV—GENERAL RESULTS.

No.	Kind.	Age, days.	Point of Curve.		Crack.		Failure.	
			Load.	Defl.	Load.	Defl.	Load.	Defl.
1	Plain	28	1,200	0.001	.....	.....	2,400	0.003
2	"	28	1,200	0.004	.....	.....	2,200	0.0145
4	1:3; 2"	25	2,500	0.026	5,000	0.140	5,500	0.163
5	"	28	2,000	0.020	5,000	0.136	6,250	0.186
6	2:3; 2"	25	2,000	0.020	5,750	0.109	10,250	0.278
7	"	27	2,500	0.030	6,500	0.133	10,250	0.278
8	1:3; 1"	25	2,500	0.016	7,250	0.138	7,500	0.145
9	"	33	2,500	0.025	6,500	0.150	7,300	0.177
10	2:3; 1"	27	3,000	0.022	10,000	0.174	12,000	0.247
11	"	25	3,000	0.026	10,000	0.158	11,800	0.208
12	1:3; 1½"	30	2,000	0.020	4,000	0.087	6,500	0.176
13	"	30	2,000	0.017	5,500	0.138	6,400	0.170
14*	Plain	7	1,400	0.004	.....	.....	3,400	0.008
15	"	8	2,000	0.0014	.....	.....	1,500	0.018
16	1:3; 2"	7	500	0.007	4,250	0.160	6,000	0.248
17	"	9	1,000	0.012	3,500	0.101	5,500	0.280
18	2:3; 1"	17	1,000	0.026	5,000	0.268	5,250	0.288
19	"	17	500	0.014	2,000	0.068	2,300	0.082
20	Cind'r	14	.....	.....	.....	.....	600	0.023
21*	"	11	205	0.003	.....	.....	1,100	0.019
21*	"	11	205	0.002	.....	.....	1,100	0.010
22	3:3; 1"	6	4,000	0.036	10,000	0.124	11,500	0.160

NOTE—Beams marked * were tested at half span.

listed with reference to these three points:

It may be said that in none of the stone concrete beams from Nos. 1 to 17, inclusive, was there any indication that the compressive strength of the concrete was reached at the load at which the reinforcement failed. If steel reinforcement had been used the compressional strength of the concrete might have been developed. Nor, as might have been expected from the results in Table III, did the reinforcement pull out from the surrounding concrete. The cement, it may be noted, was strong enough to break the stones in the section of rupture of the beam.

(2) Ratio of the Moduli of Elasticity. From Table II it may be seen that the ratio of the modulus of elasticity in compression to that in tension was 2.17, corresponding to a stress of 750 pounds per square inch in tension. It is to be noted that the ratio of the modulus of elasticity of the iron to that of the concrete in tension was 13.9. These values will apply to the beam when loaded to the point of beginning of curve in diagram.

The important fact is the increased extensibility of the reinforced concrete in tension. Thus, while the plain concrete broke with an average extension of 1:7000, the reinforced concrete broke with an average extension of 1:1140. This fact has been determined by M. Considere, who says that plain concrete breaks in tension with an elongation of one part in 10,000, while reinforced concrete breaks with an elongation of one part in 1,000.

Accepting the tensile strength of the concrete as 300 pounds per square inch, and the elongation as one part in 1,000 at rupture, the equivalent modulus of elasticity of the reinforced concrete in tension is 300,000 pounds per square inch at the stress of 300 pounds per square inch.

The ratio of the modulus of elasticity of concrete in compression to that in tension is then 12 when these moduli are taken at stresses of 1,500 and 300 pounds per square inch in compression and tension, respectively. The corresponding ratio for the iron and concrete is 96. These values will apply to the beams when loaded to the point of the first crack.

The bearing and importance of these ratios in the computation of the strength of such beams will be shown below.

From an examination of a number of stress-strain diagrams for concrete in compression it appears that a parabolic arc closely approximates the actual curve.

Analysis of the Effect of Variables.—In the beams tested, the variables were age, percentage of reinforcement, position of

reinforcement, material. One per cent. of reinforcement 1 inch from the bottom of the beam increases the strength of a plain concrete beam from 2,300 to 7,200 pounds, and increasce the flexibility from 0.01 inch to 0.14 inch center deflection.

Increasing the reinforcement from 1 to 2 per cent. of the cross-sectional area increases the strength from 7,200 pounds to 10,000 pounds with only a slight increase in the flexibility.

Placing the 1 per cent. reinforcement 2 inches from the bottom face decreases the strength from 7,200 to 5,000 pounds, with a slight decrease in flexibility.

A cinder concrete beam and a stone concrete beam each reinforced with 2 per cent. of metal, 1 inch from the bottom face, have comparative strengths of 5,000 and 10,000 pounds respectively, and a comparative flexibility of 0.26 and 0.16 inch respectively. In case of plain cinder and stone beams, the comparative strength is 600 and 1,800 pounds, and the comparative flexibility is 0.023 and 0.016 inch respectively. It thus appears that reinforcing a beam with even 1 per cent. of steel gives it ten times its former flexibility and more than three times its former strength.

Garbage Removal at Williamsport.

The council of Williamsport, Pa., is just completing the steps of adopting an ordinance governing the collection and removal of garbage and providing penalties for refusal to allow its removal, as a preliminary to advertising for proposals to collect, remove and dispose of the garbage and offal of the city for a period not exceeding three years. The ordinance seems to be an excellent one, similar in its provisions to that in use at Lafayette, Ind., given on page 329 of volume XX of Municipal Engineering.

Municipal Reports.

Annual Report of the Superintendent of Lamps and Lighting to the Mayor and City Council of Baltimore, Md., for 1901. Robert J. McCuen, Superintendent.

The electric lighting of the city is done by the United Electric Light and Power company under a five-year contract, dated Sept. 13, 1900, at the rate of $99.92 per arc lamp per year, against $127.75 for the former contract. The strength of current required is 9.6 amperes and voltage not less than 50 at each lamp, producing a 2,000 c. p. light. Tests and penalties are provided for failure of power or light.

The incandescent gas lighting of the city is done by the American Lighting company under a three year contract from March 1, 1901, at $14.15 per lamp per annum, against $23.84 under the former contract. Sixty candle power lights are required with minimum number 6,000, burning approximately 3,900 hours a year.

Gasoline lighting is done by the same company at the rate of $12 per lamp per year, with 72 to 75 degree gasoline.

Incandescent naphtha lighting is done by the same company at $28.50 per annum under a one year contract, 60 c. p. lights, 3,900 hours a year.

Incandescent kerosene lamps of nominal 2,000 c. p. are furnished under a one year contract at $84 a year by the Pan-American Light Company.

The Consolidated Gas company now furnishes illuminating gas for street lamps at $7.25 per lamp per annum, against the former price of $8.91, for 4,000 hours a year, not less than 6,000 lamps. The average candle power of the gas each month varied from 23.06 to 24.51.

Complaints of quality of gas from private consumers were numerous but of little avail. Nearly 25,000 gas meters were tested, 186 being on complaint of consumers, of which latter number sixty-seven were incorrect. Full inspection of lighting materials and lights is provided for. An attempt to place cost of arc lighting street crossings on the railroads failed.

An electric lighting commission has recently recommended municipal ownership of street lighting systems as the result of a careful study. The superintendent fully agrees with them.

Gas and maintenance of 6,097 gas lights cost $140,010.02.

Electric lights, 1,516, cost $144,135.93.

Gasoline lights, 8,707, cost $24,494.83.

Salaries and incidentals make up the remainder of $327,533.19.

Sixth Annual Report of the City Clerk and Superintendent of Water Works of Lorain, O., for year ending March 19, 1902. J. J. Mahony, City Clerk; Chas. L. Renney, Superintendent of Water Works.

The city clerk's report gives the receipts and expenditures in the various funds of the city by items, but there is no recapitulation or collection of items into classes so that it is possible to obtain an idea of the relative economy of expenditures in departments and to check the various opportunities for leaks only by spending much time in making the combination which could be so easily made by using a set of books in convenient form. The items are here, but they are comparatively valueless without much extra labor. This is a good place to apply the principles of the system of uniform municipal accounts so often referred to and explained in earlier numbers of Municipal Engineering.

The water superintendent's report gives the detail of expenditures, but it also gives summaries in tables of cost of construction and of maintenance and repairs. There are also tables of pumpage, meters and locations of pipe, fire hydrants and

valves, as well as an inventory of other property. The writer would like to know why so many pages of water works reports are taken up by lists of pipe, hydrant and valve locations, republished every year. Are they of any use to the citizen or to any one, which would not be equally well served by a convenient and well-prepared list on file in the office or posted on the office and pumping station walls?

The total receipts were $44,563.66, of which $37,415.06 were for water rents and $4,032.92 from taxes. There are about 4,000 takers, using 2,283,943 gallons a day. Construction for the year cost $21,111.30, about $5,000 for pipe, $3,000 for meters $5,000 for new iron process filter plant and $2,000 on pump. Maintenance and repairs cost $28,505.58, including $11,350 interest on bonds.

Reports of City Controller and Departments of Williamsport, Pa., for year ending March 31, 1902.

The controller's report is in detail and is also well summarized in several forms, so that it can be used easily in almost any manner desired. The park commission reports the expenditure of about $2,700 in maintaining Brandon park. The chief of police gives the usual report of offenses.

The city engineer, Frederic A. Snyder, reports for his term beginning Jan. 16 and for George D. Snyder, the engineer for last. Two streets were paved with brick, 6,644 square yards, costing $11,959, of which the city paid $7,734. One street on a gradient as high as 6.67 per cent., was paved in part with a special beveled brick, but its brick surface cost only $1.70, the other street costing $1.69. There are 148,536 square yards of paving in the city, the proportion in miles of length of various materials being: Asphalt, 2.5; brick, 3.7; cobblestone, 0.05, and telford macadam 0.07 miles. Forty-nine miles of streets are as yet unpaved.

The city sewer system is 37,585 miles long, of which 0.729 mile was built in 1901 at a cost of $3,493.12. There are 13,825 feet of electric conduit belonging to the telephone company. The engineering office cost $4,825.88, about the same as for the past three years. The fallacy of computing the cost in percentage of the improvements constructed during the year is shown by the fact that the percentages for the past three years have been 6.4, 5.9 and 23. It is hardly possible to reduce the strictly engineering force below a certain minimum, no matter what the amount of work, and, as indicated, the amount of improvements constructed may be quadrupled without increasing the engineering cost, if inspection is not included. All proposals for work are given in detail as well as the reports of work done, making the report very satisfactory.

The city solicitor and the market clerk also present their reports and the ordinances passed during the year and in force are given in full.

New Publications.

Gas, Gasoline and Oil Vapor Engines. Descriptive of their theory and power; illustrating their design, construction and operation for stationary, marine and vehicle motive power. A work designed for the general information of every one interested in the new and popular prime mover, and its adaptation to the increasing demand for a cheap, safe and easily managed motive power; containing chapters on horseless vehicles, electric lighting, marine propulsion, etc., giving the construction and details of nearly every American gas and oil engine. By Gardner D. Hiscox, M. E. Fourth edition, revised and enlarged, 369 pages, 270 illustrations, $2.50. Norman W. Henley & Co., 132 Nassau-st., New York.

This rather extended statement taken from the title page of the book, gives the purpose and scope of the book, and a rather hasty reading of it indicates that the work fulfills its purpose well. The author is sometimes very unhappy in his choice of words and the arrangement of words in sentences as well as of the matter in chapters is sometimes involved and difficult to follow, but the information is to be found and the instruction given seems to be that of an expert. It is also difficult at times to follow the numerical and algebraic work in the derivation of formulas and solution of examples on account of omissions of portions of steps without proper indication of the fact and on account of such expressions as .229 per cent., when 22.9 per cent. or 229 thousandths is the quantity intended. This method of statement is not uniform, the quantity being sometimes given correctly. With these exceptions the book is very readable and the fact that it has run through four editions since 1897 is evidence that it fills satisfactorily a want of many engineers.

After an introductory and historical chapter a number of chapters are given on the theory of gas and gasoline engines, including the utilization of heat and heat efficiencies, followed by descriptions of the difficulties in realizing the highest efficiency possible in explosive engines, including retarded combustion, wall-cooling, insufficient exhaust, compression, etc. The economy of the gas engine for electric lighting is discussed, showing its value for small installations. Then follow descriptions of the various

gases used, including coal gas, petroleum products and acetylene gas. Chapters are devoted to various details of carburetters, cylinders, mufflers, governors and valve gear, igniters and exploders, cylinder lubrication, etc. A chapter gives general instructions on the management of explosive motors, reference being made to the books of instruction issued by engine makers for specific details. Engine testing, including the machinery and methods used, occupies two chapters, and two long chapters, about 220 pages in all, are given up to descriptions and drawings of nearly all American engines of this class. A list of patents on this class of engines and their adjuncts of the various names of engines on the from 1875 to date is given, and also a list market and their manufacturers.

Municipal Administration. By John A. Fairlie, Ph. D. 448 pp. $3. The Macmillan Company, 66 Fifth-ave., New York.

Those who know the difficulties in the way of obtaining full information regarding the subject of this book will appreciate the enormous labor necessary to compile it, and the reader of the book will thoroughly appreciate the clear and logical arrangement of facts, their careful and unbiased presentation and the moderation with which the few arguments presented are stated.

The first part, 122 pages, gives a history of municipal development, with some statement of the basis of administration in ancient great cities and full outline of the modern developments of city life. The nineteenth century, especially its latter half, is shown to be the time of greatest and most rapid movement of population to cities and consequently the period of growth of municipal problems. The second part, 192 pages, describes the extension and development of municipal activities to meet the new conditions, and treats them under the heads of public health and safety, charities and provident institutions, education, municipal improvements of direct benefit to the public in general, such as sewers, streets, bridges, parks and municipal improvements having also elements of special private benefits, such as water works, lighting, transportation, markets, etc. The third part discusses the subjects of municipal expenditure, debts, revenues and finance administration, and the fourth part describes the origin and present condition of the municipal organization, including the council, the administration officials, the mayor, and ends by presenting proposed plans of municipal organization.

As the first comprehensive statement of the present condition of municipal administration and the causes which have led to it, this book should have great influence in leading its readers to see the needs of improvement and the lines in which improvement is possible, and will be a great aid in bringing about reforms, for which a few public-spirited citizens have been struggling. The fact that municipal problems are very modern and that their solution must be made without much guidance from precedent is clearly shown, and that American cities have been the leaders in some movements and will doubtless be in the advance in many others is equally evident.

The thoroughness with which the author has performed his task demands the highest praise, and the general accuracy and completeness, both in general view and in details, is evidence both of conscientious labor in collecting and arranging data and of unusual power of correlation and comparison. The number of omissions and errors is surprisingly small. Attention may be called to two or three, not in a spirit of criticism, but with the suggestion that they be considered in preparing a new edition, which will doubtless be called for soon. All are of little moment, but are noticeable in a book so free of misstatements as this. Thus there are errors in the names of Engineers Fanning, Hill and Merriman in the list of authorities on page 270. Denver and Indianapolis should be added to the list on page 275 of cities having private water works and Los Angeles should be taken off, the works having been purchased by the city. Other changes are taking place in this list which were not ready for report when the book was issued. Albany, N. Y., has sand filtration of water, not the so-called mechanical filtration, as stated on page 277. Dayton, O., might well be added to the list of prominent cities owning gas plants, on page 284. The provision in Illinois under which cities can own plants for lighting streets and public places and buildings, but cannot engage in the business of commercial lighting, is not mentioned in the discussion of the lighting question on pages 287-9. It is sufficiently interesting and aids in the author's argument so well that it seems worthy of attention, especially as the provision seems to work well in many cases. Similarly the citation of the ownership of the tramways by Toronto and the lease of their operation to a company would give a pertinent illustration of one of the author's points. Indianapolis should be added to the list of cities on page 406, in which the mayor has absolute appointive power of officials. It is one of the best examples of concentration

of responsibility in the country, the mayor and city clerk (of council and police court) and the council being the only elective officials, all others being appointed and removable by the mayor or by the boards appointed by him, and all public improvements as well as the municipal government being practically under his control and independent of the council, with the exception of the approval of the budget and of large contracts and franchises and the establishment of ordinances. The list of departments in this city on pages 401-2 would be largely reduced if those subordinate to the boards named were so classified. In the author's consideration of public improvements some statements are made which are not fully in accord with the latest expert opinion. Thus those who are familiar with the best methods of laying pavements with treated wooden blocks will not accept his statement regarding their unsanitary qualities. There is no reference to the bacterial treatment of sewage now under so much popular discussion and more or less successful experiment.

Upon the questions of municipal reform and municipal ownership or control of public service industries the author is conservative and his direction is eminently safe. A full index adds the finishing touch of satisfaction to a book which can be highly recommended to students of all shades of conviction or prejudice, as a full and accurate source of information and a safe and conservative guide in applying this information in the discussion of municipal problems.

Water and Water Supplies. By John C. Thresh, D. Sc. (London), M. D. (Victoria), D. P. H. (Cambridge). Third Edition, revised and enlarged. 527 pages. Cloth, $2 net. P. Blakiston's Sons & Co., 1012 Walnut-st., Philadelphia, Pa.

This book is apparently written from the standpoint of the sanitary adviser, and does not claim to be a treatise on engineering. It is an English book corresponding in scope and method of treatment with Nichols's and Mason's books on water supply from the sanitary standpoint, going more into the elements of the subject and treating some subjects not touched in those books, but omitting such matters as the technique of analyses. Most of the examples of practice are English, but there are many citations from American works and those of other countries. For the health officer, the water works official or the citizen desiring information upon the questions of water supply the book will be found very satisfactory both for the completeness and method of treatment, but the engineer, chemist or bacteriologist will find it simply an introduction to the subject, more than usually full, and a general view of value particularly in giving the proper perspective.

The twenty-six chapters of the book treat of the composition and properties of water for domestic purposes, of the various sources of water supply, rain and rain water, surface water, subsoil water, natural spring water, deep well waters and river water, of the quality of drinking waters, and impure water with its effect on health, of the interpretation of water analyses, of the pollution of drinking water, of its purification, including the self-purification of rivers, purification on large scale and as a domestic operation, of the softening of hard water, of the quantity of water required, the selection of sources and amounts available from various water-bearing formations, of the protection of underground water supplies, and surface supplies. There are also chapters treating in a general way the subjects of wells and their construction, pumps and pumping machinery, the storage and distribution of water, the law relating to water supplies, the advantages of small water supply systems for villages and rural communities and water charges. The chapters on quantity of water required, the law and water charges are of direct application only to English conditions, but the book with these exceptions is practically as valuable for American readers as for those directly in the author's view and some valuable hints can be drawn from all parts of the work.

Sewerage; the Designing, Construction and Maintenance of Sewerage Systems. By A. Prescott Folwell, M. Am. Soc. C. E., M. A. S. M. I., Associate Professor of Municipal Engineering, Lafayette College. 445 pp. Cloth, $3. John Wiley & Sons, New York.

This book is referred to so often in the pages of Municipal Engineering that our readers are familiar with it and can find full reviews of its contents in several recent volumes. It is again noticed here to call attention to the fact that the demand for the book has warranted a new edition about once a year since it was first issued and that advantage is taken of the opportunity to extend and revise it as may be needed to keep it even with the march of progress. The subject of sewage disposal has received extensions of treatment in each of the last two or three editions. The book is the most practical book upon the subject of sewerage now on the market, and while not so extensive nor so fully supplied with examples of work and designs for work as Moore's large book, recently reviewed, is very satisfactory to the engineer for use in his daily practice.

Linear Drawing and Lettering for Beginners. By J. C. L. Fish, Assoc. M. Am. Soc. C. E. Associate Professor of Civil Engineering Leland Stanford Junior University. Seventy pages, 7 by 10½; 46 figures. $1. Published by the author, Palo Alto, Cal. Blank book to be used for practice, 30 sheets, same size, ruled, 25 cents.

The book contains the course in linear drawing and lettering at Stanford University and an additional chapter on the application of the course to drafting. A list of the instruments required is followed by their description and instructions for their uses. The second chapter describes the method of drawing lines and constructing figures, and with the plates give full and clear instructions regarding the common faults of draughtsmen as well as regarding the proper methods. The third chapter is equally full regarding the freehand and semi-freehand lettering styles adopted by the author. The instructions regarding the making and lettering of drawings and the methods of finishing are also excellent. The book is so detailed that it makes a very valuable guide for the young draftsman and can often serve as his instructor with a few hints from more praticed men.

Albany County Officials. Illustrated Directory, 1902-3. City Officials of Albany, Cohoes and Watervliet, New York. Forrest & Foster, Publishers, Albany, N. Y.

The publishers have prepared a handsomely illustrated pamphlet giving the information about the officials of Albany county, New York, and the various towns and cities within its limits, which should be of much value to those having business with them.

Address of Robert S. Peabody, President, Delivered at the 35th Annual Convention of the American Institute of Architects in Buffalo, Oct. 3, 1901.

The subject of the address is the development and tendencies of the profession of architecture and it points out the changes which are taking place and some of the ways in which improvement can be hastened. Copies can doubtless be obtained upon application to the secretary of the institute at Washington, D. C.

Coal, Lignite and Asphalt Rock. University of Texas Mineral Survey, Austin, Tex.

This is the third bulletin of the Texas Mineral Survey and is issued by the University of Texas. It describes the mines and fields of coal and lignite in Texas, gives the results of tests of the heating powers of coal and oil, and gives the data regarding production and distribution, including freight rates.

The asphalt rocks of six counties of the state are also described, giving analyses, data of production, statement of the uses of Texas asphalt, etc. The Uvalde county asphalts are best known, having been in use for several years. There are no proper asphalts in the state, the bituminous material being found impregnating rocks, some sandstone, some limestone and some a silicious limestone. There are, however, some deposits of a heavy, black oil from which asphalt or bitumen could be distilled. The writer of the report apparently uses the term asphalt where many others would use bitumen. Texas asphalt rock has been used in pavements of San Antonio, St. Jo, Palestine, Houston and Waco, Tex., and Shreveport, La., according to this report.

Personal Notes.

J. C. Carothers has been elected city clerk at Kirksville, Mo.

R. M. Philips has been re-elected city engineer at Berkley, Va.

W. H. Whittlesey has been appointed city engineer at Bushnell, Ill.

E. Lacey Chinn has been elected engineer and surveyor at Annapolis, Md.

George S. Woodman, ex-mayor of Auburn, Me., died July 16, aged seventy years.

Maj. George H. Waring, manager of the Howard cement works at Cement, Ga., died June 26.

E. Brydone-Jack, Assoc. M. Am. Soc. C. E., has been appointed city engineer at Fredericktion, N. B.

Herbert Agans has been appointed alderman at West Bay City, Mich., to succeed Nicholas Heric, resigned.

R. I. Webber has resigned his position as borough engineer at Sewickley, Pa., to accept a position in the University of Illinois.

George P. Roth, commissioner of sewers at New Rochelle, N. Y., was dismissed from office July 9, by the common council.

J. R. Poindexter has been appointed general manager of a company which will construct the water works at Wilmington, O.

Frank L. Getman, C. E., Lyons, N. Y., has resigned his position in the Havana sewer department, and will return to the United States.

J. A. Holmes, C. E., has been appointed superintendent of the department of parks, at Cambridge, Mass., succeeding Howard C. Whiting.

C. W. Black of New York has been appointed chief engineer of the Metropolitan Street Railway at Kansas City, Mo., to succeed Durrett W. Dozier.

F. L. Sanborn, superintendent of water works at Portage, Wis., has been elected clerk of the water commissioners, to succeed F. F. Goss, resigned.

Cass Harkins, manufacturers' agent and consulting engineer of Columbus, O., has been appointed sole agent for central Ohio for the We-Fu-Go & Scaife water softening and purifying systems, manufactured by William B. Scaife & Sons Company of Pittsburg, Pa.

James Stewart, founder of James Stewart & Co., contractors, at Pittsburg, St. Louis and New Orleans, died July 5, at Pittsburg, Pa., aged 81 years.

Burton J. Ashley, chief engineer in the founding of Zion City, Ill., has removed his headquarters office from Chicago to the administration building, Zion City.

George T. Prince has been appointed first assistant engineer in charge of the corps engaged in the work of the purification and filtration of the water supply at Philadelphia.

Adin Mann has resigned his position as city engineer of Elgin, Ill., and retired. Mr. Mann, who is 86 years old, has been connected with Kane county in the capacity of engineer for 63 years.

F. D. Leffingwell has resigned as assistant engineer of the department of water supply, gas and electricity of New York City to accept that of deputy commissioner of highways at Harrisburg, Pa.

A. E. Shorthill, president of the A. E. Shorthill Company, manufacturers of machinery, boilers, structural iron and bridge material at Marshalltown, Ia., died July 6, aged fifty-one years.

Thomas Nevins, East Orange, N. J., sailed for England, July 5, to commence the construction of a system of electric railways in England, embracing 147 miles of trackage, and extending between Liverpool and Manchester.

Maj. Harry Cooke Cushing, superintendent of the street cleaning department of New York City during Col. Waring's term as commissioner of street cleaning, died at his home in New Rochelle, N. Y., July 7, aged 61 years.

MACHINERY AND TRADE.

A Rapidly Growing Business.

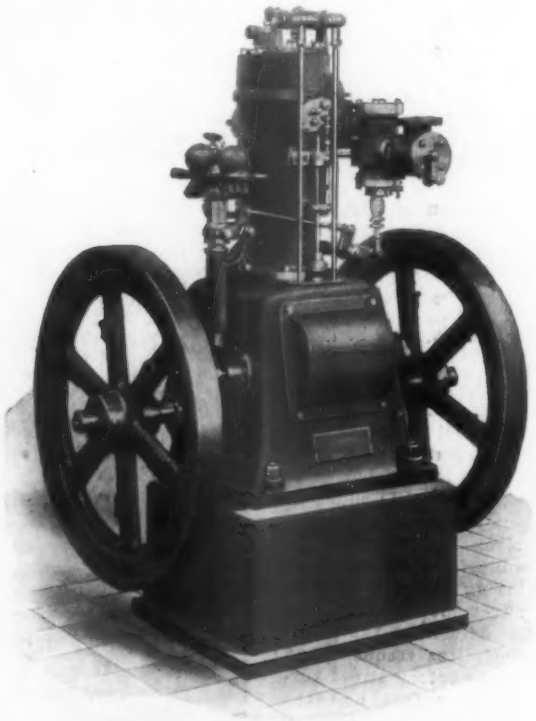
The business now conducted under the name of W. H. Anderson & Sons was established in 1871 by W. H. Anderson in a shop 18 by 20 ft. The only products manufactured were stone cutters' tools. The business increased to such an extent that before one year was over it moved into larger quarters. In 1880 the firm name was changed to W. H. Anderson & Co.

FACTORY OF W. H. ANDERSON & SONS, DETROIT, MICH.

In 1885 a new factory was built to suit requirements and the firm name was changed to W. H. Anderson & Son. In 1890 the business had increased to such an extent that it necessitated the building of an entirely new factory in a new location and equipped it with special machinery. In 1892 the firm name was changed to W. H. Anderson & Sons. In 1901 the firm had outgrown their plant built in 1890 and erected a complete and entirely new plant in the heart of the manufacturing district of the city with an exceptional right for shipping. The property has a frontage of 160 ft. on the railroad and with two tracks the entire length of the factory, it gives them exceptional facilities for shipping and receiving material. The main forge shop is equipped with steam and trip hammers, shears, punches, bolt threading machines, bull-dozers and other labor-saving machinery. Special automatic machinery for threading, tapping, forming, drilling and performing other operations, many of which are of special design to suit the particular requirements of the company, are installed in every department. In 1902 the firm was changed to an incorporated company, with a capital stock of $50,000.

The concern now manufactures a line of tools and special steel work covering many lines of trade, among the most important of which might be mentioned the the following: Cold chisels, punches and hand tools for boiler workers and iron workers; general contractors' outfits for paving, sewer building and grading; railroad contractors' tools for track-laying, blasting, etc.; builders' iron and steel work, such as truss rods, anchors,

pressed brick ties, joist hangers and special work; hoes for cultivating sugar beets and garden truck; wheelbarrows of all kinds for handling stone, coal, cement, hides, etc.; artificial stone sidewalk tools; telephone and telegraph construction tools, also special iron work and apparatus used in outside construction of telephone plants; ice tongs for family use and also the tools and tongs for harvesting ice; stone, marble and granite working tools; lathe and planer tools; quarry tools; bricklaying tools, such as hods, hammers, chisels, plumbs and levels; foundry crucible tongs and carrying shanks; automobile engine forging; die forgings for metal work.



THE WALRATH GAS OR GASOLINE ENGINE.

A Successful Gas and Gasoline Engine

The "Walrath" is the engine that was awarded the gold medal at the Pan-American exposition, and though it has been on the market less than five years its reputation has become world-wide, orders being received every day from foreign as well as domestic points.

They are built in one, two and three-cylinder types from four to 125 horse-power, the two and three-cylinder types being especially well qualified for electric lighting or other service requiring extremely close regulation of speed, while for ordinary power purposes the single cylinder type cannot be beat as to regulation or any of the various points that go to make a successful gas or gasoline engine.

They are of the well known four-cycle, throttling fly-ball governor type, the only method that has thus far proved entirely successful.

They are adapted to all kinds of stationary and portable work, such as operating concrete mixers, stone crushers, elevators or hoists and, in fact, any service where power is used.

They are entirely automatic, requiring very little attention and so simple in construction that they can be operated by a novice. There being so few working parts to get out of order the cost of repairs is reduced to a minimum, whereas the efficiency of the engine is increased on account of less friction, resulting in a saving in the cost of lubrication.

The engines are fully described and illustrated in a handsome catalogue issued by the manufacturers, whose advertisement appears elsewhere in this issue.

The company has recently increased its capital stock and is now building a new factory at Warren, Pa., with three times the capacity of their present plant. A

branch office of the Marinette Iron Works Manufacturing Company is maintained at 619 Stevenson building, Indianapolis, Ind.

A Paving Block for Rails of Street Railway.

The city of Springfield, Mass., has used for nearly four years a device of special value in paving next the rails in street car tracks. It is an iron casting grooved to receive the lip of the rail and finished with ridges on the upper surface to give a foothold for horse traffic. It stiffens the rail and by lapping the rail joints aids in producing a smoothly riding track. The block produces the same effect upon the street surface as a grooved rail with a flush surface. It is called the Buckland Paving Block. In Hartford, Conn., the blocks are used quite extensively also, and Norfolk, Va., Atlanta, Ga., and other cities have also adopted it. The block should arrest the attention of city engineers and street railway managers, as it furnishes a means of transforming the ordinary rails into full-grooved rails of any desired form of groove. The fact that the blocks can be made at any local foundry at a low rate of royalty is also in its favor.

The protection to the street paving is the office of the block which will appeal to the city official as well as to the railway company, which must make the renewals. A record of no broken blocks in four years' use in Springfield is sufficient evidence of its value in this regard.

A twelve-inch block weighs about 8½ pounds and is readily inserted along the track without delaying traffic by taking up the width of pavement necessary and placing the blocks. Afterward the street repairs will be much less frequent and easier to make. The smoother street surface resulting from this fact and the improvement of the surface next the rail on account of the form of the block prevents accidents, reduces the wear and tear on vehicles, facilitates business and makes the way of both street car and street vehicle of any kind smoother.

The Associated Road Users on Warren's Bituminous Macadam.

The Associated Road Users of America represents the Automobile Club of America, the New York Truck Owners' Association, the Road Drivers' Association of New York, the Associated Cycling Clubs of New York, the National Association of Automobile Manufacturers, the Associated Cycling Clubs of Long Island, the League of American Wheelmen and the Staten Island Driving Club.

Its meeting is evidently one of representative users of American roads. At the convention of May 6, 1902, a committee consisting of members from nearly all the bodies represented was appointed to examine and report upon Warren's bituminous macadam waterproof pavement and after careful investigation of existing pavements presented a report commending the pavement for freedom from mud and dust, absence of slippery surface, non-cracking, durability, resiliency, freedom from resistance to traction, sanitary advantages, appearance, simplicity, ease of repair, noiselessness, absence of crosswalks, availability and cheapness. The association itself at the meeting of May 27 when it was formed indorsed the report of the committee and requested it to appear before the board of local improvement and urge the adoption of the pavement for Seventh-ave. from 110th to 153d-st.

A recent number of the New York Tri-Weekly Tribune, which makes a specialty of discussions of the problems of good roads, has a long special illustrated article upon the pavement showing its advantages and method of construction.

A Commendable Custom.

The employes of the Jeffrey Maunfacturing Company of Columbus, O., had their seventeenth annual outing July 12, at Idlewild park, Newark, O. The program of amusements for the day indicates that it was very enjoyable. It has evidently been a custom of this firm for many years to mix this much pleasure with its business and it is undoubtedly of advantage to both employers and employes.

Fire Brick of High Grade.

The Reese-Hammond Fire Brick Company of Bolivar, Pa., with works at Bolivar, Fairmount and Curwensville, have secured the contract for the large new blast furnace and four hot blast stoves being erected by Julian Kennedy for the Rochester & Pittsburg Coal and Iron Company at Dubois, Pa. The Reese-Hammond Company recently furnished the brick for a blast furnace for one of the United States Steel corporation's plants, and within four months have secured orders for six blast furnaces and eight Kennedy hot blast stoves. They were also awarded the contract recently by the Union Steel Company for brick for their new open hearth plant and other furnace work being erected at Donora, Pa., amounting to about 7,000,000 high-grade fire brick from their Curwensville works in Clearfield county. This company owns a large acreage of the purest

and most refractory clays in Clearfield county and have under lease some of the most desirable territory in that country. They are increasing the capacity of their Curwensville works to 75,000 high-grade fire brick per day, building several miles of mine railway and making other extensive improvements that will, when completed, in a couple of months, make the Curwensville works not only the finest plant in the Clearfield region, which has long been conceded, but will make it the largest and best plant, possessing advantages not possessed by any other plant in the country.

The Reese-Hammond Company have almost completed their new No. 1 works at Bolivar, which replaces the old one destroyed by fire in March. The new plant is a brick structure 60 feet by 312 feet, two stories high, strictly modern in all its equipments, and will have a capacity of 30,000 brick per day. It is to be used for the manufacture of high-grade refractories exclusively.

This company has won every important contract for high-grade material for which it has contested this year, their brick proving by analysis and experiment to be superior to any other material considered, which is indeed a phenomenal record. The total capacity of their seven plants, including all classes of high-grade refractories and other fire clay products, reaches the enormous output of 285,000 brick per day, making the Reese-Hammond Company several times the largest independent fire brick manufacturers in the United States, with a well-established reputation of thirty-five years' successful experience.

Trade Publications.

Galvanum is the title of a pamphlet of the Goheen Manufacturing Company describing their paint for galvanized surfaces.

C. W. Hunt Company send attractive mailing cards descriptive of articles of their manufacture.

Public improvements are considered in an illustrated pamphlet by Willis Fletcher Brown, Civil and Consulting Engineer, Toledo, O., with special reference to the work he has planned and supervised. The photographs indicate that he is successful in securing good work from contractors. He has obtained equally good results from the printer and engraver.

Walker Manufacturing Company send a catalogue and price list of their ball joints.

Circular No. 3 of the Department of Liberal Arts of the Universal Exposition at St. Louis, 1904, is devoted to civil, military and architectural engineering. Nearly everything but engineering periodicals and books, except those relative to statistics of public works, is provided for. Instructions as to preparation of exhibits are given. Copies of the circular can be obtained of J. A. Ockerson, Chief of the Department of Liberal Arts.

Tucker & Vinton, 156 Fifth-ave., New York, make a specialty of steel concrete vault light construction and issue an illustrated circular giving the methods and results of an official test of the strength of the system by officials of the Rapid Transit Commission and Construction Company in New York.

Trade Notes.

ASPHALT.

C. M. Carpenter, general western agent of the Barber Asphalt Company, and W. R. McLaughlin, superintendent, of Omaha, have closed negotiations with F. M. Hubbell of Des Moines, Ia., for a 20-year lease of a tract of land on which a permanent plant for the manufacture of paving material will be established.

The Cardenas and Sabanilla Asphalt Company of Atlantic Highlands, N. J., has been incorporated by Wm. J. Stone of Newark, Wm. M. Foster, Edgar H. Cook, George L. Barrett of Atlantic Highlands, Salvador Arquello of New York.

The Mantanzas Asphalt Company, Newark, N. J. has been organized to manufacture and deal in asphalt by John G. H. Kramer, Louis A. Wessel, Oscar F. Miller and Henry C. Strock.

The establishment of a municipal asphalt plant is contemplated at Binghamton, N. Y.

A municipal asphalt plant is proposed at Dayton, O.

The Memphis Asphalt and Paving Company, Memphis, Tenn., has been incorporated with officers as follows: President, S. T. Carnes; vice-president, H. Duffin, general manager, J. H. Sullivan; secretary and treasurer, W. E. McGehee.

The Mexican Asphalt Paving and Construction Company, with principal office in Los Angeles, Cal., has been incorporated to conduct business in the republic of Mexico, the United States and elsewhere. Edward L. Dohery, R. J. Waters, C. A. Canfield, Carl Leonard, J. A. Fairchild, A. P. McGinnis, Chas. Wellborn, Nat W. Myrick and E. W. Gilmore are directors.

T. Hugh Boorman has established a branch office in London for the sale of his California and Venezuela bitumens. He also received the appointments of sole United States representative of the Callender's bitumen sheeting and the Gordon Crystopal, both of which materials will now be manufactured in the United States. He obtained also the United States control of the products of the Brunswick asphalt mines of the Magdeburg Company in Germany.

BRICK.

The Eau Claire Vitrified Brick Company, Eau Claire, Wis., has been incorporated to manufacture paving brick, fire brick, sewer pipe, etc. The company's lands comprise about 800 acres, which lie on both sides of the Eau Claire river, three miles east of Altoona. The incorporators are George T. Thompson, James Patrick and C. T. Bunday. F. E. Dickinson of Kendallville, Ind., is also largely interested.

The Des Moines Brick and Tile Company has been organized at Des Moines, Ia., for the purpose of establishing a brick and tile plant. C. A. Rawson, H. A. Rawson and S. J. Galvin are interested.

The Galesburg Paving Brick Company, Galesburg, Ill., has erected three large new kilns, which will increase the capacity of the plant 30 to 40 per cent.

The Steffen & Brown Paving Brick Company, Darlington, Pa., is changing the drying system from steam to hot air, the heat to be supplied by means of furnaces.

The Jerome Brick and Tile Company, Jerome, Mich., has commenced active operations. Foundation brick, sewer pipe and possibly paving brick will be manufactured. A. O. Jones, formerly of Zanesville, O., is superintendent.

A new paving brick plant is being built by the Hydraulic Press Brick Company of St. Louis, Mo., adjoining its works on the Missouri Pacific tracks and King's highway.

The Georgia Vitrified Brick Company, Augusta, Ga., has been incorporated by Frank R. and Clarence E. Clark and E. J. O'Connor.

The Lawton Vitrified Brick Company, Lawton, Okla., has been incorporated by James F. West, Allen Fields and J. T. White.

A new paving brick company has been organized by the business men of New Straitsville, O. The company desires to purchase good machinery and will be pleased to communicate with manufacturers. Address F. S. Miller, New Straitsville, O.

The Caney Vitrified Brick Company, Caney, Kas., has begun operating its new plant.

CEMENT.

A large deposit of gypsum has been located on Freshwater bay, southeastern Alaska, by the Pacific Coast Gypsum Company, of which A. C. Little of Tacoma, Wash., is at the head.

A plant will be established at Effingham, Ill., for the manufacture of cement paving blocks.

The West Virginia Lime and Cement Company, Burlington, W. Va., has been incorporated by Henry E. Weaver, E. A. Bickett, C. E. Ferguson, Henry L. Steon and Israel E. Robinson of Grafton, W. Va.

The Raven Lake Portland Cement Company, Ltd., of Toronto, Canada, has been incorporated with directors as follows: Hon. Geo. McHugh, Victoria, Ont.; John Lucas, Duncan Robertson, Thos. Christie, Toronto; J. H. Carnegie, Gobonock, Ont.; W. Sargent, Barrie, Ont. The plant will be located at Raven Lake, Victoria Co., Ont.

The Federal Cement Company, Camden, N. J., has been incorporated to manufacture cement by Wm. Jay Turner, Morris Faezler and Geo. H. B. Martin.

The West German Portland Cement Company, Chelsea, Mich., has been incorporated, and options on the marl land around Four-Mile lake have been secured Detroit parties are interested.

ELECTRIC.

The Vermont Power and Manufacturing Company, 15 Exchange-place, Jersey City, N. J., has been incorporated to acquire riparian rights in and to water falls, streams of water and adjacent lands, and to supply water power for manufacturing electricity, etc. Kenneth K. McLaren, W. L. Fairchild, Howard K. Wood, incorporators.

The General Electric Company has leased a plant at Lynn, Mass., and begun the manufacture of incandescent lamps.

The Automatic Incandescent Light Company, Camden, N. J., has been incorporated.

Newly incorporated companies: American Gas and Electric Company, East Orange, N. J.; Merchants' Heat and Light Company, Indianapolis, Ind.; Madison Gas and Electric Lighting Company, Madison, Ind.

J. W. Peterson, who was formerly connected with the Chicago sales department of the Stanley Electric Manufacturing Company and the Northern Electrical Manufacturing Company, has been elected vice-president and general manager of the Electrical Equipment Company, with offices at Suite 939, Monadnock Block, Chicago. This company now has on hand several large contracts for complete light and power plants.

Franchises to construct and operate electric street railway lines throughout the city of Havana, Cuba, have been granted Messrs. Park & Hamilton of Youngstown. The concessions, which include all the franchises in the city of Havana, are said to be worth $25,000,000. Connected with Messrs. Park & Hamilton are DeWitt, Tromble & Co. of Chicago, G. F. Penhill & Co. of New York, H. W. Whipple of New York, H. W. McDonald & Co. of Chicago and W. J. Hayes & Sons of Cleveland.

MISCELLANEOUS.

The Southern Creosote Works, Nashville, Tenn., has been incorporated to treat lumber by the process of creosote and to manufacture telephone poles and appliances. D. C. Buntin, Leland Hume, T. D. Webb, J. L. Bland and W. L. Granberry are the incorporators.

Mineral City, O.—The Canton-Sparta Brick Company is in the market for a good second-hand rock crusher.

The James E. Brooks Company, New York City, has been incorporated to manufacture bridge and structural work by J. E. Brooks, H. P. Lancaster and A. D. Morris of New York City.

Bids were received at Pasadena, Cal., July 15, for a 10-ton steam road roller, as follows: Kelly-Springfield Road Roller Company, $3,975; Stevens Hardware Company, to supply O. S. Kelly Company roller, $3,687.50; same to supply Oastler roller, $3,300; Russell Engine Company, Massillon, O., $3,600; Buffalo Pitts Steam Roller Works, $3,999.

The Haverhill Fire Appliance Company, Kittery, Me., has been incorporated to manufacture and deal in fire extinguishers. The officers of the company are: President, Horace Mitchell of Kittery; treasurer, A. M. Nelson of Newcastle, N. H.

The Cope Bridge Company, Chattanooga, Tenn., has been incorporated by Morris Cope, Oliver J. Cope, Carroll T. Cope, Walter B. Cope and John O. Byrd.

The Palmer Concrete Hollow Block Company of Indianapolis, Ind., has been incorporated by A. J. Gardner, H. H. Symmes, H. P. Dye, J. F. Messick and A. J. Ralph.

Bids were received, July 10, at Winona, Minn., for street signs, as follows: Metal Stamping Company of Niagara Falls, 21, 23½ and 25 cts. each; Wisconsin Supply Company of Milwaukee, 1,000 signs at 31 cts. each; J. R. Baker & Co., Winona, 21½, 30¾ and 31¾ cts. each; Geo. V. True, Winona, 25 and 32 cts. each; G. A. Kasper, Winona, 35 cts.; G. W. Jefford, 47 cts. each, and in lots of 1,500 or more, 45 cts. each.

The American Paving and Construction Company, Wilmington, Del., has been incorporated.

The Empire Contracting Company, 15 Exchange Place, Jersey City, N. J., has been incorporated by Louis B. Duley, H. O. Coughlan and Kenneth K. McLaren.

SEWER PIPE.

The Des Moines Sewer Pipe and Tile Company, Des Moines, Ia., has been incorporated by J. R. Rollins, Jesse F. Stevens and H. A. Rawson. The company will not engage in manufacturing, but will job the output of other plants and engage in the wholesale business.

Pittsburg capitalists will build a large sewer pipe plant near New Cumberland, W. Va., according to press reports.

The Mason City Sewer Pipe Company, Mason City, Ia., has been incorporated by O. T. Denison, F. E. Keeler, Lynn Denison, C. H. McNider and F. A. Stephenson.

The Southern Sewer Pipe Company, Birmingham, Ala., has purchased a site at North Birmingham for its proposed plant, and has begun the erection of twenty kilns and a factory building. A. S. Russell, 325 Chalifaux building, prest. and mgr.

Recent Inventions.

703,025. June 24, 1902. Center Construction for Floor Arches. G. B. Waite, Hoboken, N. J. A hanger for use in fire-proof construction made of wire twisted in the form of a double loop, the upper loop to hold metallic members, the lower loop to support temporary centering.

703,081. June 24, 1902. Machine for Molding Artificial Stone. N. F. Palmer, Brooklyn, N. Y. A mold with movable core support, to which a sectional core is adjusted, a partition between the sections and a false bottom.

703,119. June 24, 1902. Railway Tie. A. F. Crotser, Fulton, Mich. Comprising the body portion, containing openings which register the keyhole slots in the fastening plates, bolts to engage the plates and hold the rail in position and a wedge piece to retain bolts in position.

703,140. June 24, 1902. T-square. G. M. Lees, Dublin, Ireland. A T-square, the arm provided with an anti-friction roller, the perimeter projecting slightly below the arm.

703,185. June 24, 1902. Roadway for Motor Vehicles. A Clark, Evanston, Ill. Consisting of two parallel concrete tracks and pavement guard rails.

703,194. June 24, 1902. Street-Sweeper. P. H. Hamsbury, New York City. A sweeper supporting beneath the body a conveyer-casing with brush mounted on its open front end, means to operate the brush and conveyer.

703,344. June 24, 1902. Mortar-Bed. J. M. Holloway, Santa Barbara, Cal., assignor to Mary E. Holloway, same city. A portable mortar-bed, comprising sills, a bottom and separate side pieces, end pieces fitted between the side pieces and inclined inwardly in opposite directions, and clamps.

703,352. June 24, 1902. Wheeled Scraper. T. D. Radcliffe, Lawrence, Kansas, assignor of one-third to C. R. Metcalf, same city. Comprising a wheeled supporting axle, a pan pivotally supported, locking means to hold pan upright; the frame having a releasing handle, and a tilting frame carried on the pan adapted to be swung and interlock with the wheel-rims on the forward rotation of the wheels.

703,424. July 1, 1902. Rotary mixer for concrete, etc. W. J. Judd, New York City, assignor to F. C. Austin, Chicago, Ill. Comprising a double cone-shaped, rotary mixing-drum containing mixing devices, mechanism for rotating and tilting the drum, and mechanism for arresting the tilting movement of the drum.

703,452. July 1, 1902. Machine for molding artificial stone. N. F. Palmer, Brooklyn, N. Y. Combination of a mold with an adjustable grooved core, and with a partition engaging the core-groove.

703,596. July 1, 1902. Apparatus for purifying water. C. L. Kennicott, Chicago, Ill. Combining an annular soft-water tank inclosing intercommunicating precipitating and chemical-solution tanks, a stirrer within last-named tank with water-wheel geared to it and having a discharge leading to the upper portion of the precipitating-tank and a hard-water supply for the wheel.

703,644. July 1, 1902. Method of making cement fence-posts. Edward Davies, Reading, Mich. Placing material in a mold where it remains until hard enough to handle, then dipping in a bath of liquid hydraulic cement.

SELECTIONS FROM THE PRESS.

Acetylene Lighting Plants for Villages.

The dark streets in many small towns make travel at night disagreeable to many, and those who must go out frequently carry lanterns to light their way. The progressive citizens, more considerate of their friends and neighbors, maintain oil lamps on their grounds. This darkness has been avoided whenever the town grew to sufficient size to afford the expense of lighting the streets and maintaining an illuminating gas manufacturing plant. The advent of the acetylene gas generator has materially changed these conditions and there is hardly a village too small to enjoy the benefits of the brilliantly lighted street which the acetylene plant has made possible. Some interesting information as to the selection of the apparatus and the cost of producing gas is furnished us by Russell C. Miller, superintendent of the Lakeville Gas Company at Lakeville, Conn. His communication is as follows:

We have received a number of letters asking for information in reference to our village acetylene gas lighting plant. I thought an answer that I have prepared for one correspondent would give information to many other interested persons if presented through the columns of the Metal Worker. In selecting a gas machine or generator, after picking out a simple, safe and efficient machine, a good sheet metal worker should be employed to go all over it carefully to see that it is well made, strongly riveted, as well as heavily soldered. The riveting is necessary, as solder does not stand well or hold strong on galvanized iron, and without riveting frequent repairs become necessary and leaks add materially to the cost of the gas as well as prove an important factor of expense.

Plants should be Double and Automatic —For a town lighting plant a twin system should be provided, or it should have two washers and two connections to the gasholders, so that if anything happens to one the other can be used. In course of time something is bound to happen, no matter what the manufacturers may claim to the contrary. In such an event the supply can be taken from the generator not under repair without interrupting the lighting. The apparatus should be strictly automatic. Our plant was bought for an automatic plant, but after running it awhile we found that it was not. It has since been remodeled and repiped with improvements so that it now works continuously and automatically, which not only saves labor, but also time and care in watching it.

The gas generating plant should be placed outside of the main town or village, as there are some odors when it is necessary to recharge or remove the residue from the apparatus, although it is not especially offensive. The building in which the generator is placed should be heated in winter by steam or hot water, hot water being more economical. The heater should be placed in a small building by itself, with a space between it and the building containing the generating plant. The heating pipes between the two buildings should be covered to prevent loss of heat. The main building should be placed so that it can be well ventilated, and an arrangement should be made for a large or one foot burner to be placed on the outside of a tight window of the generating building. It should be inclosed in a box the same as a stable lamp with a reflector. This is so that work can be done in the generating building at night without danger from inside lights. This will be found a great convenience. The main gas meter should be placed in the plant building with a valve on both inlet and outlet connections. A platform should be placed in the plant house in a dry place for supporting the carbide drum.

Grading and Testing the Service Pipes—The main pipes and service pipes through the street should be laid about three feet deep, and the first 200 feet of the main pipe should grade back to the generator house, with a pet cock at the low end to allow condensation to be drawn off. Galvanized iron fittings should be used, as they save extra cost from leaking, the sand holes and other defects being filled with the zinc coating. It is important to be sure that the piping system is tight. All the pipes, main branches, etc., should be tested until it is certain that they are absolutely tight. There is no middle ground, a system is either tight or it leaks. A leak in an acetylene gas piping system means a larger consumption of carbide, therefore a higher cost of gas per foot. In coal gas, where the by-products almost pay for the making of the gas, leaks are not of such much account. A piping system should stand a ten pound pressure of air for five minutes at least. Valves or stops should be placed on the mains at intervals of 1,000 feet and on all the branches from the main, and small valves on the service pipes as they start from the mains and branches. There should also be a valve on each side of the house meter. The stops on the mains should be arranged with a curb box, so that access to the stop can be had without digging. In laying the mains I

think it is best to grade them to some low point; at any rate in very low places or at the foot of hills.

Disposing of Condensation in Mains—A U-shaped pipe should be taken out of the bottom of the main and dropped down so that condensation may collect in it below the freezing line. The other end of the U should come up above the surface of the ground so that any accumulated moisture can be pumped out. It is claimed that there is no condensation in acetylene piping after the first 200 feet from the generators. It may not condense the same as coal gas, but experience demonstrates that moisture does form in acetylene pipes even at a distance of three-quarter mile from the gas house, and ice was formed in a pipe for a space of six inches in length, stopping street lighting entirely. This was with a system where no trouble was experienced during the first winter. There are instances, however, that have come under my notice where trouble was had during the second and third winters.

Size of Pipe—In piping dwelling houses ⅜-inch pipe can be used for all runs. This size of pipe will supply 45 one-foot burners, and with its use manufacturers need carry but one size of fitting. This size of pipe fits most of the gas fixtures. A little care in piping an old house with ⅜-inch pipe will allow the pipe to be so run that it will not show, making a good job and almost as cheap as in a new house.

Table of Pipe Sizes—For street mains, start at gas house and reduce as branches are taken off.

2,565 lights	4	inch pipe.
2,138 lights	3½	inch pipe.
1,645 lights	3	inch pipe.
1,097 lights	2½	inch pipe.
784 lights	2	inch pipe.
490 lights	1½	inch pipe.
377 lights	1¼	inch pipe.
175 lights	1	inch pipe.

—House Piping.—

45 lights	⅜	inch pipe.
77 lights	½	inch pipe.
130 lights	¾	inch pipe.
208 lights	1	inch pipe.

Size of Plant and Holders—A 2,000 light machine lights the towns of Lakevillle and Salisbury. It costs 1 cent to 1 1-5 cents per foot to make the gas, and from 4 to 4½ feet of gas is made from 1 pound of carbide. Carbide costs $68 per ton at Niagara Falls, and the freight to Lakeville is $6.10 a ton, with 75 cents additional per ton for carting. The labor, charging and attending the fire and other work at the Lakeville plant cost $12 per month, in addition to superintending, and our output is about 9,500 cubic feet of gas per month. In selecting an apparatus I would advise a 2,000 light apparatus if 1,000 lights are to be supplied. It avoids the care of watching on extra occasions and saves labor through requiring to be charged less often.

The gasholder should be extra large for town plants to hold over-generation. For instance, with a 1,000 light machine 500 takers are stores, which close about the same time. Now say your plant machine is feeding carbide into water, or water on carbide, for 1,000 lights and the stores, 50 per cent. of the lights, close at 10 o'clock. The result for a few minutes is sure to be an over generation of gas. If the holder is not extra large the gas is lost through the relief pipe, causing odor and adding extra cost to gas made.—The Metal Worker.

IMPROVEMENT AND CONTRACTING NEWS.

PAVING.

Port Huron, Mich.—A good roads train will leave this city July 31 for a tour over the state.

San Antonio, Tex.—A paving contract has been completed in this city involving the laying of six miles of asphalt.

Newport News, Va.—Warren Bros. of Boston commenced the work of paving Twenty-third-st. with Warren's bituminous macadam, July 7.

Erie, Pa.—The Cleveland Trinidad Paving Company has been notified that if the city engineer is satisfied that the work of repaving State-st. is unnecessarily delayed he has the power to declare the contract null and void and to have the work done under the supervision of some other contractor.

CONTEMPLATED WORK.

Des Moines, Ia.—Paving is contemplated for E. Walnut-st.

Bushnell, Ill.—Paving is contemplated for several streets.

Boise City, Idaho—Brick paving is proposed for S. Eighth-st.

Mt. Gilead, O.—Plans have been approved for paving Marion-st.

Poplar Bluff, Mo.—Main-st. is to be macadamized. Mayor Abington.

Newark, O.—The construction of sidewalks is proposed. Mayor Forry.

Belleville, Ill.—The city council is considering the question of improving W. Main-st.

Ebensburg, Pa.—The question of street paving is being agitated.

Dayton, Ia.—Cement sidewalks are contemplated for a number of streets.

Brainerd, Minn.—Paving is recommended for Kindred-st. in East Brainerd.

Salem, Mass.—The question of paving lower Lafayette-st. is being considered.

Moline, Ill.—Ordinances were passed July 7 for paving Ninth-st. with asphalt.

Oak Park, Ill.—A plan is being considered for paving Grove-ave. with macadam.

Winnipeg, Minn.—Asphalt paving is proposed for Young-st. C. J. Brown, cy. clk.

Escanaba, Mich.—The city council has ordered Sarah-st., from Jacob to Tweedy, paved.

Redding, Cal.—The question of paving the business streets is being revived.

Boston, Mass.—The estimated cost of repaving Albany-st. with granite block is $56,700.

Tyrone, Pa.—The highway com. has been authorized to ask for bids for paving Tenth-st.

Cincinnati, O.—Brick and asphalt paving is contemplated for the streets of Mount Adams.

Frederick, Md.—The residents on E. Church-st. have petitioned for vitrified brick paving.

Nevada, Mo.—A resolution has been adopted to pave Cherry-st., from Washington to Cedar, with brick. Mayor Wright.

Mitchell, S. D.—The construction of a number of cement walks is contemplated.

Morgan, Minn.—The construction of an 8-ft. cement walk on Vernon-ave. is contemplated.

Earlham, Ia.—The city contemplates rebuilding its sidewalks with brick and cement.

Jamestown, N. Y.—Brick paving is contemplated for a portion of Forest-ave. C. B. Jones, cy. clk.

Lowell, Mass.—The sum of $38,390 will be appropriated for paving several streets with asphalt.

Atlanta, Ga.—Hexagon tile sidewalks are contemplated for Peters-st., from Forsythe to Walker.

Lead, S. D.—Bids will be asked soon for 1 m. of brick or stone paving. J. P. Crick, cy. engr.

Worcester, Mass.—The city council has decided to pave Main-st. with granite blocks. Mayor Fletcher.

Bloomington, Ill.—Monroe and Jefferson-sts. will be paved with asphalt. Elmer Folsom, cy. engr.

Grand Rapids, Mich.—The committee on streets has reported in favor of macadam for N. Fayette-st.

Ottumwa, Ia.—The property-owners on N. Market-st., between Third and Fourth, have petitioned for paving.

Little Rock, Ark.—An ordinance has been passed appropriating $30,000 for paving W. Market-st. with asphalt.

West Superior, Wis.—Estimates for macadamizing a portion of Hughitt-ave. will be made by Cy. Engr. Thomas.

Pontiac, Mich.—The city engineer has been directed to prepare estimates and plans for paving Oakland-ave.

Auburn, N. Y.—Bids will probably be asked in August for paving a street with asphalt. E. H. Herr, cy. engr.

Trenton, N. J.—About $35,000 will be expended in repairing and repaving the principal streets with asphalt.

Ft. Scott, Kas.—Bids will be asked soon for twenty-five blocks of vitrified paving. U. S. Stoner, cy. engr.

Atchison, Kas.—A resolution has been passed to pave Tenth-st. with vitrified brick. Fred Giddings, cy. engr.

Duluth, Minn.—A petition is being circulated among the business men on Central-ave. asking that the street be paved.

St. Paul, Minn.—Bids will be asked for at once for paving Robert-st., from Seventh to University, with brick.

Rome, N. Y.—Plans and specifications for paving W. Embargo-st. with asphalt, macadam or brick have been adopted.

Camden, N. J.—The question of improving the streets on the East Side is being considered. St. Com'r. Mohrman.

Duluth, Minn.—The question of paving Michigan-st. and First-ave., E., with sandstone blocks is being considered.

Richmond, Va.—The question of constructing better streets for the residence portion of this city is being agitated.

Hyde Park, O.—Sealed bids are asked until Aug. 12 for bonds for improving Edwards road. Frank B. Ebersole, clk.

Rushville, Ind.—On July 19 the city council authorized the construction of cement walks on E. Tenth and Maple-sts.

Albany, N. Y.—Ordinances have been approved for paving Orange, Spruce, Plain, Broadway and Fulton-sts. and Fourth-ave.

Macomb, Ill.—Ordinances have been introduced for paving E. Jackson, E. Washington and S. Lafayette-sts. with brick.

Lincoln, Neb.—Bids will be received Aug. 4 for intersection, funding and water bonds. Beman C. Fox, cy. treas.

Frederick, Md.—The residents of E. Church-st., from Chapel alley to East-st., have petitioned for vitrified paving.

Louisville, Ky.—Plans have been authorized for paving Mechanic, Graham and Fulton-sts. with macadam and granitoid.

Rock Island, Ill.—An ordinance has been passed for paving two blocks of Twenty-first-st. with asphalt. Wallace Troichler, cy. engr.

Atchison, Kas.—A resolution has been passed for brick paving and cement curbing on Division-st. Fred Giddings, cy. engr.

Owosso, Mich.—The board of public works has been directed to secure estimates for paving W. Main-st. with macadam and crushed stone.

Newark, N. J.—Ordinances have been passed for paving S. Eleventh, S. Sixth, E. Kinney, School and Camden-sts. and Grafton and Central-aves.

Little Rock, Ark.—The mayor has been authorized to ask for bids for ten blocks of asphalt paving on W. Markham-st. J. H. Haney, cy. engr.

Cortland, N. Y.—A petition is being circulated asking that Clinton-ave., from

Main-st. to the D., L. W. railroad tracks be paved.

Memphis, Tenn.—The property-owners on a number of streets are in favor of paving. Asphalt is proposed for Central-ave. Mayor Williams.

Des Moines, Ia.—The city council has ordered the construction of brick paving on certain streets and alleys and objections will be heard Aug. 18.

Bellaire, W. Va.—Ordinances have been prepared for paving Nineteenth, Thirty-third and Noble-sts., and for cement sidewalks on Harrison-st.

Moundsville, W. Va.—The county court has decided to pave the county road for 1,500 feet west of the fair grounds bridge over Little Grove creek.

Michigan City, Ind.—The residents of Coolspring and Springfield townships are agitating the question of constructing about ten miles of macadam roads.

East Grand Forks, Minn.—The bids received July 15 for thirty-two blocks of paving have been laid over until Aug. 5, owing to an error in the advertising.

Albany, N. Y.—Ordinances have been signed for paving Van Zandt, Fulton and Plain-sts. and repairing a portion of Broadway with asphalt.

Jersey City, N. J.—A petition has been submitted to the board of finance that Grand-st., from Hudson-st. to Pacific-ave., be paved with granite block.

Menominee, Mich.—The city engineer has been directed to prepare plans and specifications for paving Main-st., from Ogden-ave. to the lower bridge, with brick.

Wausau, Wis.—This city is confronted with the problem of a choice of materials for replacing the worn-out cedar block pavements, according to press reports.

Mobile, Ala.—Contracts will be let soon for 30,000 square yards of rock asphalt and 16,000 square yards of brick paving on sand foundation. D. M. N. Rose, city engineer.

Wayne, Mich.—The St. Clair Hights Improvement Association has been organized for the purpose of letting contracts for 10,000 feet of cement walks. U. S. King, secretary.

Nashville, Tenn.—The property-owners on Broad-st. and West End are circulating a petition asking that those thoroughfares be paved with bituminous macadam.

West Bay City, Mich.—The ordinance committee has been directed to prepare an amendment to the ordinance governing the construction of sidewalks.

Oneida, N. Y.—The specifications for paving Main-st. and Lenox-ave. with brick or asphalt have been filed. Bids for $25,000 bonds for this work will be received Aug. 4.

Cincinnati, O.—Bitulithic macadam paving has been decided upon for Warsaw-ave., Wilder and Glen-sts.; macadam on Eastside and Westside-aves. and Southside; brick on Kuhlman-ave.

Marshalltown, Ia.—Specifications were adopted July 18 for paving S. Third-ave. with brick on concrete base. The residents on Jerome-st. have petitioned for asphalt paving on concrete.

Niagara Falls, N. Y.—The council has declared its intention of paving Fourth-st., from Erie to Jefferson-ave., and Thirteenth-st., from Buffalo-ave. to the New York Central tracks, with asphalt.

Trenton, N. J.—An ordinance is pending which provides for a $35,000 bond issue for repaving and repairing the principal streets in the central part of the city with asphalt.

Williamsport, Pa.—Ordinances have been passed for repaving Court, Willow and West-sts. The property owners on Market-st., from P. & E. R. R. to Rural-ave., have petitioned for paving.

Sioux Falls, S. D.—A resolution was approved July 10 to grade and curb the intersections of the streets and alleys on Thirteenth-st., from Seventh-st. to Walts-ave. George W. Burnside, mayor.

Memphis, Tenn.—The cy. com. has decided to construct asphalt paving in ten streets, brick on two streets and gravel and block stone on two streets. J. J. Williams, mayor; A. T. Bell, cy. engr.

Sandusky, O.—Cy. Engr. Miller has prepared plans and specifications for paving Hayes-ave. as follows: Brick, $20,860; block asphalt, $40,915; sheet asphalt, $36,200; bituminous macadam, $31,368.

West Bay City, Mich.—The ordinance committee has been directed to prepare an amendment to the ordinance governing the construction of sidewalks, permitting the building of cement walks in the outlying districts.

St. Clair, Mich.—(Special)—Plans and specifications for 30,000 sq. yds. of brick paving are being prepared by Willis F. Johnson, cons. engr., 55 Law Bldg., Toledo, O., and bids will be asked soon.

Naperville, Ill.—Ordinances have been passed for building brick or vitrified tile sidewalks on Van Buren, Benton, Douglas and Jefferson-ave., and West, Eagle and Wright-sts. Thomas Betts, mayor; Oscar H. Givler, cy. clk.

Topeka, Kas.—A petition submitted to the county commissioners asking for a 20-ft. brick pavement extending from the end of the W. Sixth-ave. pavement to the brick plant, through Gage park, and the Kansas river bridge north of the brick plant.

Dayton, O.—Resolutions were adopted July 17 for constructing cement sidewalks on Geyer, Second, Easton, Holt and First-sts. and Dakota Drive. Ordinances were also passed for paving Fifth-st. from Linden-ave. to Findlay-st., and grading and graveling Parknell and Herman-aves. and Hulbert and Auburn-sts.

Huntsville, Ala.—The business men in the eastern part of Madison county and the western part of Jackson county are reviving the project of connecting the pike systems of the two counties by building a link of pike road about 5 mis. in length. This connection section would give a pike system 250 mis. long.

Muskegon, Mich.—Ordinances have been adopted to construct cement and stone sidewalks in various streets; repaving Western-ave., from Goodrich to Eleventh-st., with vitrified brick or concrete; Muskegon-ave., from Pine to Seventh, with vitrified brick or Warren's bituminous macadam; Grand-ave., from Jefferson to Peck-sts., and Third-st., from

Houston-ave. to Jefferson-st., with asphalt blocks. Theo D. Morgan, mayor.

CONTRACTS TO BE LET.

Rome, N. Y.—Bids will be received Aug. 8 for paving W. Embargo-st.

Des Moines, It.—Bids are asked until 11 a. m. Aug. 15 for 200 sq. yds. of paving in an alley.

Youngstown, O.—Sealed bids are asked until 12 m. Aug. 2 for paving Holmes-st. C. E. Cross, clk.

Waterbury, Conn.—Bids for paving N. Main-st., from Abbott-ave. to Cook-st., will be received until 4 p. m. Aug. 5.

Green Bay, Wis.—Bids are asked until 12 m. Aug. 7 for constructing 4,000 sq. yds. of cement sidewalks. Cy. clk.

Corry, Pa.—Sealed bids are asked until 8 p. m. Aug. 4 for 16,000 sq. yds. of brick paving. Nevin R. Dickson, cy. engr.

Allentown, Pa.—Bids are asked until Aug. 4 for 3½ mis. of grading and macadamizing. Lehr & Bascom, 7 S. Seventh-st.

Trenton, N. J.—Bids are asked until Aug. 5 for paving E. Front-st. with asphalt over Belgian blocks. C. E. Murray, cy. clk.

Butler, Mo.—Sealed bids are asked until 12 m. Aug. 4 for grading at Cornland bridge. R. E. Johum, bridge comr.

Vincennes, Ind.—Bids are asked until Aug. 15 for building 22 mis. of gravel road in Washington township. J. D. Williams, co. audt.

St. Marys, O.—Bids are asked until Aug. 9 for paving Wayne-st. with brick or asphalt, with stone curbing. J. H. Rowe, jr., clk.

Newport, Ind.—Sealed bids are asked until Aug. 19 for building 21 mis. of gravel road in Clinton township. W. P. Bell, co. audt.

Sioux City, Ia.—Sealed bids are asked until 8 p. m. Aug. 5 for grading W. First-st., from Bluff to Main. A. L. Harding, chamn. grading com.

Williamsport, Ind.—Sealed bids are asked until 1:30 p. m. Aug. 5 for constructing 53,220 ft. of gravel road. Wilmer H. Gemmer, supt.

Ft. Sheridan, Ill.—Bids are asked until Aug. 12 for building a macadam road at the military reservation. Col. E. B. Atwood, chmn. Q. M., Chicago.

Spring Green, Wis.—Bids are asked until Aug. 5 for constructing 384 ft. of 8-ft. cement sidewalk, with curb and gutter. W. G. Kirchoffer, engr., Baraboo.

Crookston, Minn.—Sealed bids are asked until 7 p. m. Aug. 12 for 19,180 sq. yds. of asphalt paving and 1,112 lin. ft. of curbstone. Geo. A. Ralph, cy. engr.

Cleveland, O.—Bids are asked until Aug. 13 for paving a portion of Petrie-st. with Medina dressed block stone on concrete base. Chas. P. Salen, dir. pub. wks.

Ashland, Wis.—Bids are asked until Aug. 7 (readvertisement) for 8,970 sq. yds. of macadam paving, 2,250 cu. yds. of excavation and 4,000 lin. ft. of curb. M. T. Dozer, cy. engr.

Crawfordsville, Ind.—Sealed bids are asked until 4 p. m. Aug. 11 for building cement sidewalks in John-st., from Franklin to Freemont. James A. McClure, cy. clk.

Mechanicsville, N. Y.—Sealed bids are asked until 8 p. m. Aug. 6 for paving Main and Railroad-sts. with vitrified block on concrete. N. W. Kelso, vil. clk. C. E. Hicks, vil. engr.

Toledo, O.—Sealed bids are asked until Aug. 11 for paving Union and Cherry-sts. and Walbridge-ave. with vit. blks., Kreodone creosoted blks., asp. blks. or asphalt. Charles H. Nauta, cy. clk.

Lodi, N. J.—Bids are asked for Aug. 3 for 18,400 sq. ft. of bluestone flagging, 3,200 sq. ft. of cement sidewalks, 4,000 lin. ft. of bluestone curbing and various other street improvement work.

Buffalo, N. Y.—Sealed bids are asked until 11 a. m. Aug. 5 for repaving Clinton-st. and paving South-st. with the various kinds of pavement and macadamizing Parkside-ave. Francis G. Ward, com'r. pub. wks.

Chanute, Kas.—Sealed bids are asked until 6 p. m. Aug. 5 for paving Main-st. between Forrest and Central-aves., with vitrified brick on crushed rock or gravel foundation. John F. Roe, mayor; John C. Penny, cy. clk.

Galveston, Tex.—Bids are asked until Aug. 9 for furnishing 500,000 best quality vitrified brick of standard size, bidders to state price f. o. b. cars at point of manufacture, and f. o. b. cars at Galveston. John D. Kelley, secy. com'rs.; C. G. Wells, cy. engr.

Cincinnati, O.—Sealed bids are asked until Aug. 5 for paving Eggleston-ave., from Pearl to Broadway, with granite blocks; Holloway-ave., from Gilbert to Fairfield-ave., with brick; Forest-ave., from Carthage Pike to Eden-ave., with macadam. Bids are asked until Aug. 19 for paving Beekman-st. with granite block. Robert P. Allison, prest. Bd. Pub. Imp.

Indianapolis, Ind.—Sealed bids are asked until Aug. 4 for paving an alley with brick on concrete, and certain sidewalks with cement. Bids are asked until Aug. 8 for paving Laura-st., from Washington to Jackson-st., with flint rock macadam, and the sidewalks of Vermont-st., from State-ave. to Randolph-st., with cement. Harold C. Megrew, chmn. B. P. W.

New York City—Bids are asked until Aug. 4 for repaving with asphalt, on present block paving, Forest and Park-aves.; asphalt paving, including binder course, 41,665 sq. yds.; old stone pavement to be relaid as foundation, 41,775 sq. yds., furnishing and setting bluestone curbing, 17,550 lin. ft.; rejoining and setting old curbstone, 5,700 lin. ft.;; repaving with asphalt on concrete the intersections of several streets, 3,700 sq. yds. of asphalt, including binder course. Washington-ave., requiring 55,200 sq. yds. of asphalt, including binder course, 65,300 sq. yds.; concrete, 11,250 cu. yds., rejoining and resetting old curbstone, 28,800 lin. ft. Louis F. Hoffen, prest. Bronx Boro.

CONTRACTS AWARDED.

Kansas City, Mo.—Asphalt paving contracts were awarded July 16 as follows: Barber Asphalt Paving Co., Lydia-ave., $2.15 a sq. yd.; Woodland-ave., $2.15; Parker-Washington Co., Illinois-ave., $2.15.

Erie, Pa.—The contract for paving Holan-st. with brick was awarded to Mayer Bros.

Oskaloosa, Ia.—Geo. H. Carlon &Son secured the contract for paving C-st. from High to First-ave.

Billings, Mont.—The contract for building 6,346 sq. ft. of sidewalk was awarded July 17 to Ben Hager.

Wilkesbarre, Pa.—The Warner-Quinlan Asphalt Company has been awarded asphalt paving contracts for $41,060.

Rome, N. Y.—The contract for paving the street car track area was awarded July 21 to the Warner-Quinlan Asphalt Company.

Joliet, Ill.—Monahan Bros. secured the contract for paving D'Arcy-ave. with macadam for $1,137.

South Windsor, Conn.—The contract for 3,928 ft. of macadam pavement was awarded to A. C. Sternberg of West Hartford at $1.25 a ft.

Chester, Pa.—The contract for paving Devine-st. was awarded July 7 to the Northern New York Asphalt Paving Company for $4,359.

Bay City, Mich.—J. L. Labo has been awarded the contract for building a brick sidewalk on Broadway, between Twenty-ninth-st. and Fremont-ave.

Ashland, Wis.—The contract for paving Second-st. and Ellis-ave. with asphalt was awarded to the Barber Asphalt Paving Company.

Wenona, Ill.—The contract for building concrete walks was awarded to the Kankakee Artificial Stone Company.

Topeka, Kas.—Wall & Hanlet secured the contracts for paving a number of streets with brick at $1.17½ and $1.26 a sq. yd.

Newport, Ky.—Peter Ader has been awarded the contract for building cement walks around the new city building and jail.

Camden, N. J.—The contract for macadamizing Sandy Lane road was awarded July 9 to the Delaware Mining and Granite Company for $15,848.

Roseville, Ill.—The contract for 2,100 ft. of cement sidewalk has been awarded to Tury & Lewis of Galesburg at 17 cents. a sq. ft.

Milwaukee, Wis.—The contract for paving the Sixteenth-st. viaduct with creosoted blocks was awarded July 22 to Paul Froeming for $45,390.

Beloit, Wis.—J. A. Heineman of Chicago was awarded the contract for 1 mi. of brick and macadam paving in this city for about $20,000.

Milwaukee, Wis.—The Reliance Construction Company was awarded the contract July 9 for 5,000 sq. yds. of brick paving on Thirteenth-st.

Clayton, Mo.—The contract for improving Oakwood-ave. between Summit and Bompart, was awarded July 7 to the Novaculite Paving Company of St. Louis.

New York City—Bids were received July 18 for 18 asphalt contracts. The bids ranged from $1.10 to $2.25 a sq. yd., the average price being $1.40 a sq. yd.

Evansville, Ind.—The contract for paving Cherry-st., from Eighth to Garvon, with Kentucky rock asphalt was awarded July 9 to White & Eichel.

Oshkosh, Wis.—Contracts for paving Algona-st., from Light to Bond; Wangoo, from Main to State, and Ceape-st., from Main to State, with brick was awarded July 8 to Harding & Nelson at $2.39 a sq. yd.

Chattanooga, Tenn.—The only bid submitted July 8 for paving W. Ninth-st. with asphalt, to replace the present Belgian block pavement, was that of the Southern Paving & Construction Co., at $2.70 a sq. yd.

Hillsdale, Mich.—The contract for paving Howell, Hillsdale and N. Broad-sts. with Metropolitan block, was awarded to W. J. Berry of Bellaire, O., at $1.75 a sq. yd., including cement curb and gutter, drainage, etc.

Brooklyn, N. Y.—Bids were submitted July 23 for paving a number of streets with asphalt. It is believed the contracts will be divided between the Crawford Co., the Interstate Paving Co., and the Green River Asphalt Paving Co.

Chattanooga, Tenn.—The contract for paving W. Ninth-st., from Market to Chestnut, with asphalt was awarded July 15 to the Southern Paving & Construction Co., at $2.70 a sq. yd. and $2 a sq. yd. for all surfacing or repairs.

Benton Harbor, Mich.—The Barber Asphalt Paving Co. was awarded a contract July 11 for paving Elm-st. and the Pipestone-st. extension at $1.95 a sq. yd. for asphalt paving; exca., 25 cts. a cu. yd.; combined curb and gutter, 55 cts. a lin. ft.

Elwood, Ind.—The contract for paving S. Twenty-second and S. G sts. has been awarded to W. W. Hatch & Son of Goshen. Logan brick will be used for paving the streets, vitrified brick for sidewalks and stratified limestone curbing.

Davenport, Ia.—Bids were received July 15 for brick paving for Brown, Taylor, Myrtle and Fifteenth-sts. The lowest bids were submitted by the Hawkeye Construction Co. and the People's Construction Co., and the contracts will probably be divided between the companies.

Colorado Springs, Colo.—J. Fred Roberts was awarded the contract July 19 for grading and cement sidewalks in the central district, as follows: Grading, 50 cts. a cu. yd.; cement walks, 15 cts.; 4 in. flagstone, 21½ cts. a sq. ft.; 6 in., 40 cts.; relaying old stone, 5 cts. a ft.; total, $26,708.15.

Cedar Falls, Ia.—(Special)—F. O. Jackson, cy. clk., says that the city council awarded a contract July 21 for 17,454 sq. yds. of brick paving to the Likes Improvement Co. of Des Moines, as follows: Paving, $1.21 a sq. yd.; curbing, 16 cts. a lin. ft.; exca., 16 cts. a cu. yd.

Philadelphia, Pa.—Bids were received July 22 for about $1,500,000 worth of asphalt paving and repaving. Bids were submitted by the Pennsylvania Asphalt Paving Co. and the Vulcanite Paving Co., and they ranged from $2.45 to $2.55 a sq. yd., although in some instances the bids were as high as $2.60 a sq. yd.

Duluth, Minn.—The contract for paving between the street car tracks was awarded July 8 to P. McDonnell of Duluth, and for paving outside the tracks to Burke Bros.

Oak Park, Ill.—The contract for paving Oak Park-ave., between Iowa and Augusta-sts., with asphalt was awarded July 8 to Andrew Jaicks of River Forest for $6,606.15.

Syracuse, N. Y.—The Syracuse Improvement Company has been awarded the contract for the repair of the asphalt pavement on W. Onondaga-st., from S. Salina to Onondaga circle, for $6,851.

Dayton, O.—Bids were received July 23 for paving Maple-st., from Wilkinson-st. to the Boulevard, and Central-ave., from River to Grand, with asphalt, brick and Warren's bituminous macadam. The bidders were the Central Bitulithic Paving Company, Barber Asphalt Paving Company, J. E. Conley, E. Brentlinger, David Beard and the Ayers Asphalt Paving Company.

St. Joseph, Mo.—Paving contracts have been awarded as follows: Macadamizing Sixteenth-st., from Frederick to Buchanan-aves., Fred Roth; building second-class walks on Augusta-st., from Second to Sixth, D. B. Kelly; asphalt paving, Sylvanie-st., from Thirteenth to Fifteenth, Barber Asphalt Paving Company; brick paving, Union-st., from Frederick-ave. to Twenty-fifth-st., Wm. Land.

Chicago, Ill.—Paving contracts were awarded July 15 as follows: Brick paving, an alley, Clybourn-ave. and Roby-st., Citizens' Construction Company; blast furnace slag and crushed limestone, W. Eighty-eighth-st., Illinois Improvement and Ballast Company; granite top slag macadam, N. Humboldt-st. and Rogers-ave., and brick paving, Blue Island-ave., Jas. A. Sackley; paving a system of streets with granite top slag macadam, R. F. Conway Company.

Syracuse, N. Y.—The contracts for paving Almond, Lemon and W. Fayette-sts. with vitrified brick were awarded July 14 to F. J. Baker. The Barber Asphalt Paving Company was awarded the contract for paving Lexington-ave., from Cherry-st. to Columbus-ave., with Trinidad asphalt, with Mack brick between the railway tracks, and C. H. Horton the contract for paving Cortland-ave., between Smith-st. and Onondaga-ave., with Nelsonville block.

Buffalo, N. Y.—Bids have been submitted for 13,710 sq. yds. of paving on Woodside-ave. as follows: Asphalt—Barber Asphalt Paving Company, $30,024; Warner, Quinlan Company, $32,767; German Rock Asphalt and Cement Company, $37,420; Interstate Paving Company, $35,000; Eastern Construction Company, $29,340; H. P. Burgard, $30,750. Brick—H. P. Burgard, $30,750; L. H. Gipp, $28,767; G. W. Patridge, $31,100; John Mumm, $32,450.

Detroit, Mich.—Bids for repaving Eighteenth-st., between Perry and Myrtle-sts., and Fifteenth-st., between Warren and Kirby-aves., were received July 21. The bids on cedar block paving were 15 per cent. lower than any heretofore submitted this season. Currie & Conn were the lowest bidders on Eighteenth-st., at $7,907.46, and Julius Porath on Fifteenth-st., at $5,650.82. Bids were also received for repaving Gratiot-ave. and Rowland-st. with asphalt blocks. These bids were considerably lower than any bids previously received. W. E. Lennane was the lowest bidder on each street.

SEWERS.

Darlington, S. C.—The Darlington Sewer Company has been incorporated to build and equip a sewerage system for this city.

Indianapolis, Ind.—The Northwestern-ave. sewer will be of concrete and steel, 12 ft. wide and 3½ ft. high.

Springfield, Mass.—The city solicitor has rendered an opinion relative to the responsibility for expense when water mains and gas pipes are removed to make way for sewers. He is of the opinion that the water department must bear the expense of removing its pipe under conditions cited.

CONTEMPLATED WORK.

Voted: Marshfield, Wis. Mayfield, Ky.

Elizabeth, Pa.—An 18-inch pipe sewer on Market-st. is contemplated.

Armstrong, Ia.—Plans for a sewerage system have been prepared.

Salisbury, Md.—An ordinance has been passed to build a main sewer in Camden-ave.

Franklin Falls, N. Y.—The extension of the sewerage system is proposed.

Batavia, N. Y.—Plans for a new and adequate sewerage system are being considered.

Omaha, Neb.—The question of building a 4-foot brick sewer will be voted on.

Will Vote: Georgetown, S. C., July 29; San Antonio, Tex., July 31; McDonald, Pa., Nov.

Ames, Ia.—Plans for a complete sewerage system will be made by Prof. A. Marston.

Stevens Point, Wis.—The construction of 1½ miles of sewerage is contemplated.

Portland, Or.—It is believed that the Albina sewer system will be built next fall.

St. Charles, Mo.—Plans for a sewerage system are being prepared by Carr Edwards, cy. engr.

West Carthage, N. Y.—This town voted to expend $15,000 to $25,000 for the construction of sewers.

McDonald, Pa.—The borough officials contemplate expending $50,000 for a sewerage system.

Contemplated: Rapid City, S. D.; Geneva, O.; Jefferson, Ia.; Lancaster, Wis.; Dike, Ia.; Tecumseh, Mich.

Omaha, Neb.—A resolution has been adopted to build a sewer on Williams-st., from avenue D to Mills-st.

East Syracuse, N. Y.—The question of building sewers will be voted on. Charles P. Manahan, vil. prest.

Glenville, O.—A resolution has been passed for a storm water sewer for the streets west of Doan.

Tacoma, Wash.—The sum of $11,000 has been appropriated for constructing the Edison trunk line sewer.

Cheyenne, Wyo.—The construction of 5,000 ft. of 24-in. pipe sewers is contemplated. W. D. Pease, cy. engr.

Sioux City, Ia.—Plans and specifications for the new sewer have been completed by J. M. Lewis, cy. engr.

Carthage, N. Y.—Plans for the West Carthage sewerage system have been approved by the state board of health.

Erie, Pa.—An ordinance has been recommended for passage providing for the construction of a 12-in. sewer in Third-st.

Belleville, Ill.—City Engineer Graner estimates the cost of the W. Main-st. sewer at $14,614.40. Mayor Hay.

Rensselaer, N. Y.—The question of a sewer in Broadway, from the south line of Bath Village to Fowler-ave., is being agitated.

Brainerd, Minn.—Mayor Halsted has recommended that the city engineer be directed to prepare plans for a sewerage system.

New Albany, Ind.—The special committee on sewers favors a plan for a general system of sewerage. Cy. Engr. Coolman.

Columbus, Miss.—The sum of $50,000 has been voted to complete the present sewerage system, build a stand pipe, etc.

Syracuse, N. Y.—An ordinance was adopted July 21 authorizing the issue of $40,000 bonds for improving Onondaga creek.

Harrisburg, Pa.—The plans and specifications for the Paxton creek sewer are about completed and bids will be asked soon.

Painesville, O.—A resolution has been passed for building a sewer in Washington-st. Geo. A. Bates, mayor; H. C. Garrett, clk.

Los Angeles, Cal.—The question of issuing $1,400,000 bonds for extending the sewerage system will be voted on Sept. 17.

Niagara Falls, N. Y.—The estimated cost of extending the Chasm-ave. trunk sewer is $17,500 to $19,151. Cy. Engr. McCulloh.

Champaign, Ill.—A petition is being circulated for building an 8-ft. brick water conduit or sewer through the basin of the Boneyard.

Sterling, Ill.—A petition is being circulated among the property-owners asking the council to construct a sewerage system.

Yazoo City, Miss.—An ordinance has been passed authorizing an issue of $200,000 bonds for a sewerage, water works and electric light system.

Dunkirk, N. Y.—The common council declared its intention July 15 to construct a trunk sewer in Roberts-road to connect with the Brooks interception sewer.

Hanover, Pa.—Arrangements for building a sewerage system with septic tank sewage disposal plant are being made by Wm. McLean, A. C. Huntzinger and others.

Mt. Pleasant, Mich.—(Special.)—Plans and specifications for about 4,000 ft. of main sewer in district No. 7 have been completed by Willis F. Brown, cons. engr., 55 Law bldg., Toledo, O.

Washington, D. C.—The district commissioners have set aside $50,000 from the appropriation for assessment and permit work, 1903, for the construction of sewers.

West Hartford, Conn.—(Special.)—Surveys for sewers for the Southeastern district have been made by A. B. Alderson, town engr., and the work of construction will commence about Sept. 1.

Elkhart, Ind.—The city clerk has been authorized to ask for bids for a sewer in Franklin-st., between 8th and Oakland, and Lexington-ave., between the river and River-ave.

Ft. Madison, Ia.—(Special.)—J. H. Einspanjer, cy. clk., says that this city contemplates the employment of a competent engineer for sewer construction; re-establishment of grades and other city work. Address J. H. Einspanjer, cy. clk.

CONTRACTS TO BE LET.

Waverly, Ia.—Bids are asked until Aug. 5 for an 8-in. sewer.

Waterbury, Conn.—Bids are asked until Aug. 5 for sewers on Park and Clinch-sts.

Canton, O.—Bids are asked until Aug. 4 for 15 mis. of sewers. P. H. Weber, cy. engr.

Wilmont, Minn—Bids are asked until 8 p. m., Aug. 5, for 2,500 ft. of sewer. S. L. Long, vil. recorder.

Cleveland, O.—Bids are asked until Aug. 5 for sewers in four streets. Chas. P Salen, dir. pub. wks.

Green Bay, Wis.—Bids are asked until 12 m., Aug. 7, for 571 ft. of 12-in. sewer in Ashland-ave.

St. Paul, Minn.—Bids are asked until Aug. 5 for sewers on Acker, Jackson, Valley and Jessamine-sts.

Trenton, N. J.—Bids are asked until Aug. 5 for sewers in Fall and Warren-sts C. E. Murray, cy. clk.

Westfield, Mass.—Bids are asked until Aug. 6 for 4,610 ft. of 54-in. brick sewer. Jas. H. Clark, chmn.

Belfast, Me.—New bids will be received at 5:30 p. m., Aug. 4, for building an extension to the Front-st. sewer.

Corry, Pa.—Bids are asked until Aug 4 for ½ mi. of 10, 12 and 15-in. sewers. Nermis R. Dickson, cy. engr.

Monterey, Mex.—Sealed bids are asked until Aug. 15 for a sewerage system. Gov. P. Benitez Leal, State of Nuevo Leon.

Youngstown, O.—Sealed bids are asked until 12 m., Aug. 2, for building sewers in McKinnie-st. and Maple-ave. C. E. Cross, clk.

Torrington, Conn.—Bids are asked until Aug. 12 for sewers and appurtenances in various streets. F. Fuessenich, sewer comr.

Elkhart, Ind.—Sealed bids are asked until 4 p. m., Aug. 6, for building sewers in Oakland and Lexington-aves. Kit McKean, cy. clk.

Portland, Me.—Bids are asked until Aug. 4 for a sewerage system at Ft. McKinley, Diamond Island. Capt. A. W. Yates, Q. M., U. S. A.

Davenport, Ia.—Bids will be received until 2 p. m., Aug. 5, for 190 ft. of 10-in. sewer on Ninth-st. and 706 ft. 15-in. sewer on Eddy-st. B. P. W.

Abilene, Kas.—Sealed bids are asked until 2 p. m., Aug. 6, for constructing a system of public and district sewers. P. H. Halleck, mayor; C. C. Wyandt, clk.

Norristown, Pa.—Sealed bids are asked until 8 p. m., Aug. 12, for building pipe

sewers with laterals, manholes, flush tanks, etc. S. Cameron Corson, boro. engr.

Grinnell, Ia.—Bids are asked until Aug. 4 for building a sewage disposal plant, including 400 ft. of 18-in. sewer and a 250,000-gal. septic tank. H. W. Spaulding, mayor.

New Orleans, La.—Sealed bids are asked until Aug. 12 for building 98 mls. of brick and pipe sewers with 1,150 manholes and 520 flush tanks. F. S. Shields, secy. sewerage and water board.

Galveston, Tex.—Bids are asked until Aug. 9 for furnishing 7,300 ft. of 36, 30, 24, 18, 12-in. vitrified or cement sewer pipe with branches. John D. Kelly, secy. bd. comsrs. C. G. Wells, cy. engr.

Indianapolis, Ind.—Sealed bids are asked until Aug. 8 for a sewer in Laura-st., from Washington to Jackson-st. and until Aug. 13 for a main sewer in Northwestern-ave. Harold C. Megrew, chmn. B. P. W.

Newark, N. J.—Sealed bids are asked until 8:30 p. m. Aug. 7 for building section 3 of the joint outlet sewer for Newark, Irvington, So. Orange, Summit, West Orange, Millburn and Vailsburg. W. L. Glorieux, chmn.

New Britain, Conn.—Bids are asked until Aug. 16 for constructing section 1 of the proposed disposal system, including the building of 31 filter beds, laying 1 mi. of under drain, 1 mi. of 24-in. main sewer, etc. W. H. Cadwell, engr.

Cincinnati, O.—Sealed bids are asked until Aug. 2 for constructing a concrete semi-circular arch culvert in Ross River creek on Carthage pike, Wallank twp. E. L. Lewis co. audt. Bids are asked until Aug. 13 for a sewer in Jerome-ave. and until Aug. 14 for a sewer in Quebec-ave. Robt. Allison, prest. B. P. I.

Ardmore, Pa.—Sealed bids are asked until 10 a. m. Aug. 4 for 41 mls. of terra cotta pipe sewers in lower Merion twp. and two stations to collect and pump sewage to high level sewer and laying 3,000 ft. of 10-in. and 6,700 ft. of 12-in. iron pumping mains. Chester E. Albright, C. E., 908-9 Land Title bldg., Philadelphia; William E. Barrett, chmn. health and drainage com.

CONTRACTS AWARDED.

Meridian, Miss.—The contract for laying sewers was awarded to D. D. Briggs.

St. Paul, Minn.—The contract for a sewer in Cook-st. was awarded to W. J. Preston for $2,294.

Hampton, Ia.—The contract for a sewerage system was awarded to Oliver Knight of Dubuque for $14,166.50.

Kansas City, Mo.—The contract for a sewer in dist. No. 148 was awarded to W. J. Stevenson & Co. for $3,197.

Canton, S. D.—C. L. Lytle of Sioux City secured the contract for building 4,000 ft. of sewer at 60 cts. a ft.

Jamestown, N. Y.—The contract for extending the sewerage system has been awarded to Mahoney Bros. & Gardner.

Villisca, Ia.—The contract for a sewerage system was awarded to Donnegan & Sullivan of Shenandoah for $3,000.

Morrison, Ill.—The contract for the East End sewerage system has been awarded to Mason & Skoog of Kewanee for about $9,000.

Brockport, N. Y.—The contract for constructing a sewerage system was awarded to Thomas Holahan of Rochester, according to press reports.

New York City—The only bid received July 15 for building sewers in Wicker and Van Corlear-places was that of William E. Welch for $18,295.

Canandaigua, N. Y.—The contract for a sewer in N. Pleasant-st. has been let to C. D. Chisholm for $2,000, and in Gorham-st. for $1,000.

Troy, N. Y.—Behan & Cavanaugh were awarded a contract for a sewer in Sheridan-ave. at $12.80 a lin. ft. for sewers and 89 cts. a ft. for laterals.

Des Moines, Ia.—The contract for constructing 9,330 ft. of brick and clay pipe intercepting sewer in Highland park was awarded July 21 to William Harrabin of Iowa City for $24,000.

Camden, N. J.—Sewer contracts have been awarded as follows: S. A. Barto, for Aaron Ward—Ferry-ave., 99 cts. a lin. ft.; Ninth-st., 87 cts.; Westfield-ave., $1.93. William Thompson—Mechanic-st., 97 cts.

Des Moines, Ia.—The state board of control is reported as having recommended that contracts for sewage disposa. plants at three state institutions be awarded to the Cameron Septic Tank Company of Chicago, as follows: Orphans' home, Davenport, $4,450.; Mt. Pleasant insane hospital, $7,250; Industrial school at Mitchellville, $2,625.

WATER-WORKS.

Nashville, Tenn.—The board of health will test the entire water supply of this city.

Effingham, Ill.—The question of municipal ownership of the water works will be voted on.

Waukesha, Wis.—The property of the Waukesha Water Company was sold at a forced sale June 26 to Edward H. Everett of Newark, O., for $47,450.

St. Cloud, Minn.—The Industrial Trust Company of Providence, R. I., has declined the offer of the city to purchase the water works plant for $65,000.

Kingston, N. Y.—Judge Betts has granted a petition to condemn certain lands required for water purposes, and to appoint commissioners of appraisal on behalf of the Forestburg Water Company.

St. Louis, Mo.—Water from the Missouri river for use of the county residents will be turned on Jan. 1, 1903. The towns that will be benefitted are Kirkwood, Webster Grove, Ferguson and Clayton.

Helena, Mont.—A temporary injunction was issued by Judge H. C. Smith of the district court July 24 restricting the Helena Water Works Company from turning off the water for fire and sewerage purposes.

Burlington, Ia.—An injunction has been granted by Judge Withrow which deprives this city of purchasing the water works plant. The injunction is granted

on the ground that the debt incurred would exceed the constitutional limit.

Crookston, Minn.—Artesian wells are being put down for a new source of water supply. Iron in the water from a filter gallery has caused so much trouble that the wells are made necessary. The filter gallery has been in use about two years.

Brooklyn, N. Y.—In his report of July 7 retiring Commissioner Daugherty says that the work on the Millburn pumping station should be completed at the time set by the extension allowed, while the contracts for the additional pumping engines should be let shortly.

Linton, Ind.—(Special.)—Emanuel Dixon, supt., wrote that the Linton Water Company would begin operations in full on July 15, 1902, with officers as follows: President, Joe Moss, Linton; vice-president; F. M. Dugger, Bloomfield; secretary and treasurer, D. J. Terhune, Linton.

Newly incorporated companies: Greenwood Light and Water Company, Greenwood, Miss.; Birmingham and Suburban Water Works Company, Wilmington, Del.; Carrollton Water, Light and Railway Company, Carrollton, Mo.; National Water Works and Guarantee Company, Scranton, Pa.; Wilford Water Company, Wilford, Ind.; Benton Water Supply Company, Benton, Ill.; Oxford Water Company, Oxford, Ind.; Aurora Water Works Co., Aurora, Ind.

Denver, Col.—A proposition was made to the city July 9 by F. F. Noxon, who proposes to deed in fee simple to the city the Tarryall creek reservoir. In return he asks that the city give him the exclusive right to use the water for power purposes between the dam and Deansbury. The cost of the dam to collect the water and of expenses in connection with the construction of the reservoir, of flumes and pipe line to Deansbury is estimated at $1,800,000.

CONTEMPLATED WORK.

Oneida, N. Y.—Plans were approved July 16 for extending the water mains.

Front Royal, Va.—The question of building a new reservoir is being considered.

Norway, Mich.—The extension of the water mains is contemplated.

Fayette, Miss.—Bids will be asked soon for a water works system. C. H. Jenks, engr.

Richmond, Va.—The question of installing a plant to furnish clear water is being agitated.

St. Cloud, Minn.—The Industrial Trust Company contemplates the installation of a filtering system.

Bracondale, Ont.—A proposition to secure a water supply has been submitted by W. H. Edwards.

Anita, Ia.—The advisability of erecting a plant to furnish clear water is being considered.

Lawrence, Mass.—A contract will be let soon for constructing the dividing walls at the filter gallery.

La Junta, Colo.—Plans for improving the water works are being considered by the city council.

Yazoo City, Miss.—The question of issuing $20,000 bonds for a water works system will be voted on.

Voted: Bedford, Wis.; Paul's Valley, I. T.; Centerville, N. Y.; Tabor, Ia.; Golden, Col.; Pomeroy, Wash.

Springfield, Il.—The estimated cost of securing an adequate water supply is $25,000. Frank H. Hamilton, cy. engr.

Pickens, Miss.—Plans for a water works system will be made by Kirkpatrick & Johnson of Jackson, Miss. J. F. Wilburn, town clk.

Victoria, Tex.—The question of issuing $75,000 worth of water works bonds for laying a 12-in. main was favorably voted on July 16.

Will Vote: Carthage, N. Y., July 29; Meridian, Miss.; St. Francisville, La.; Pomeroy, Wash., Aug. 4; Luray, Va., Aug. 5; Pennsgrove, Pa., Aug. 5.

Portsmouth, N. H.—The question of extending the water works to secure an increased water supply is being considered. Water Comr. Farrington.

Oakland, Ill.—(Special.)—W. P. Fanning says that this city contemplates the construction of a system of water works at once, and invites correspondence on the matter.

Mt. Pleasant, Mich.—(Special.)—Willis F. Brown, cons. engr., 55 Law Bldg., Toledo, O., has recommended the sinking of additional wells to obtain an adequate water supply.

Meridian, Miss.—This city has negotiated for the purchase of 15 acres of land on Mt. Barton, one mile south of the city, on which to erect a mammoth reservoir for the operation of an independent water works system.

Contemplated: Mesa, Ariz.; Angola, N. Y.; Clinton, N. C.; Elizabeth City, N. C.; Yazoo City, Miss.; Freeport, O.; Mitchellville, Ia.; Ruthton, Minn.; Gentry, Ark.; Medford, O. T.; Avon, S. D.; Hartwell, Ga.; Ruthven, Ia.; Carnegie, Pa.; Richfield, Utah; Meade, Kas.; Cheyenne, Wyo.; Bellaire, O.; Dickson, Tenn.; Dyer, Tenn.; Animos, Col.; Deer River, Minn.; Lidgerwood, N. D.; St. Ansgar, Ia.; Westbrook, Minn.

CONTRACTS TO BE LET.

Sequin, Tex.—Bids will be received Dec. 1 for pumps for an irrigation system. Charles and Hugo Troell.

Elyria, O.—Bids are asked until Aug. 7 for a new water works system. George E. Crisp, secy. trustees.

Wilmont, Minn.—Bids will be received Aug. 5 for a water works system. S. L. Long, vil. recorder.

Monterey, Mex.—Bids are asked until Aug. 15 for a water works system. Gov. P. Benitez Leal of State of Nuevo Leon.

East Grand Forks, N. D.—Bids are asked until Aug. 9 for laying water mains on DeMers-ave. Henry Harm, cy. recorder.

Ithaca, N. Y.—Bids are asked until Aug. 20 for 121 new hydrants. Prest. Cole of Fire Com'n; A. G. Marion, cy. clk.

Tell City, Ind.—Bids are asked until Aug. 12 for furnishing and laying a 4-in. c. i. water pipe in Mozart-st. H. J. Stuehrk, cy. clk.

New Orleans, La.—Sealed bids are

asked until Aug. 12 for furnishing pumping, steam and electrical equipment. F. S. Shields, secy. sewerage and water bd.

Chicago, Ill.—Sealed bids are asked until Aug. 13 for furnishing three pumping engines for the Chicago-ave. pumping station. F. W. Blocki, comr. pub. wks.

St. Louis, Mo.—Bids are asked until Aug. 8 for steam and feed water piping and filters, galleries and platforms at H. S. Station No. 1. Hiram Phillips, prest. B. P. I.

Tyrone, Pa.—(Special.)—J. Luden Henry, engr., says that sealed bids are asked until Aug. 10 for building a reservoir and laying about 600 ft. of 12 and 10-in. pipe.

Washington, D. C.—Sealed bids are asked until Aug. 12 for the excavation, concrete masonry, c. i. pipe and specials, sluice gates, water valves, meters, filter sand, gravel American Portland cement, vitrified pipe and a 120,000,000-gal. centrifugal pumping plant. A. M. Miller, St. Col. Engrs., 2728 Penn-ave.

CONTRACTS AWARDED.

Jacksonville, Ill.—The contract for supplying this city with water was awarded July 10 to W. F. Mayhon.

Edgerton, Minn.—The contract for a tower and tank was awarded to W. D. Lovell of Des Moines for $6,047.

Burwell, Neb.—A contract for a water works system was awarded July 22 to the United States Supply Co., of Omaha, for $4,600.

Schleswig, Ia.—The contract for a compressed air water works system was awarded July 20 to the National Construction Co., of South Bend, Ind., for $5,300.

Wilmington, O.—The contract for the construction, maintenance and operation of a water works system has been awarded to J. R. Poindexter of Cynthiana, Ky.

Kenmore, N. Y.—The contract for furnishing this village with water was awarded July 14 to the Depew & Lake Erie Water Co. The company will soon ask for bids for its distributing system.

Charleston, S. C.—The contract awarded the American Pipe Mfg. Co. of Philadelphia for designing and building the new water works provides for the following: A timber and earth dam on Goose creek eleven miles northwest of the city; a pumping station there with a 100-ft. brick stack; one 3,000,000 and two 5,000,000-gal. high-duty pumps; one 5,000,000 and two 3,000,000-gal. low-duty pumps; 600 H.-P. in boilers; a 5,000,000,-gal. mechanical filter plant, with a 10,000,000-gal. sedimentation reservoir and a 2,000,000-gal. clear-water basin; a 24-in. cast iron force main to and through the city, eight miles of distribution mains, 114 hydrants, and the valves and specials needed in the improvement of the piping now in the city. J. W. Ledoux is ch. engr. of company.

STREET LIGHTING.

Howell, Ind.—A franchise has been granted the Evansville Electric Light Co.

Jamestown, N. D.—A new 25-year franchise has been granted the Jamestown Electric Light Co.

The question of constructing an electric light plant was favorably voted on at Winsboro, N. C.

Lead, S. D.—A franchise has been granted the Dickenson-Ames Co., to establish and operate a gas plant.

Verndale, Minn.—Plans for an electric light plant are being made by O. Claussen, of St. Paul.

Willows, Cal.—Bids are asked until Aug. 11 for the purchase of a franchise for a power plant.

Bellefontaine, O.—A resolution has been passed appropriating $15,000 for improving the gas works.

Cadillac, Mich.—The Cadillac Gas Co. will begin making gas about Aug. 10. W. J. Cornwell, prest., Cadillac.

Camden, N. J.—The contract for furnishing gasoline lamps was awarded to the International Light, Heat and Power Co.

Detroit, Mich.—Bids are asked until Aug. 29th for electrical supplies and an engine. Pub. Lighting Comrs.

Pontiac, Mich.—Bids are being asked, according to press reports for lighting the city for 3, 5 or 7 years.

Joliet, Ill.—The mayor has been authorized to enter into a 5-year contract with the Economy Light and Power Co., for lighting the streets.

Whiting, Ind.—(Special)—The contract for an addition to the Whiting Electric Light Co.'s plant was awarded to the Electrical Equipment Co., of Chicago.

Baldwinsville, N. Y.—A contract for street lighting has been awarded the Seneca River Power Co., at $32.00 each per year for 50 c. p. Nernst lamps.

Contemplated—Elmore, O.; Eaton, O.; Bradensburg, Ky.; Brigham City, Utah; Hartwell, Ga.; Lucas, O.; Duncan, I. T.; Yazoo City, Miss.; Francisville, La.

Pontiac, Mich.—The Home Gas Co. has secured a 30-year lease on the P. O. & N. railroad property and will commence the erection of a large gas and electric plant.

Kensington, Md.—An ordinance has been passed granting permission to the Kensington Light, Heat and Power Company to construct a plant for acetylene or other gas.

Havana, Cuba.—The Spanish-American Light and Power Company will extend its plant by purchasing a 1,800-kilowatt outfit. Chas. Worchuff, ch. engr.; R. Jimenez, engr. electrical dept.

East St. Louis, Ill.—Clark Bros. of Philadelphia have acquired the Citizens' Electric Light and Power Company and will operate it in connection with their street railroad interests.

Rochester, N. Y.—The contract for lighting the city for five years was awarded to the Rochester Gas and Electric Company at 21½ cts. a night for 2,000 candle-power light and 18¼ cts. for 1,200 candle-power lights.

Gallipolis, O.—A franchise has been granted Maxom & Eysenbach of Coshocton for constructing an electric light plant and furnishing electric light for ten years at $52.75 per arc lamp per annum,

moonlight schedule; fifty 16 candle-power incandescent lamps at $5 per annum.

Portland, Or.—This city will let a contract next January for street lighting. The board of public works has received a communication from the Reserve Foundry & Mfg. Co. of Cleveland, O., offering to introduce gasoline lighting.

Cedar Falls, Ia.—(Special.)—F. O. Jackson, cy. clk., says that this city has not made a satisfactory settlement in regard to granting a new gas franchise, and he would like to correspond with parties who desire to receive such grant, or with those who wish to make a proposition to the city.

Pittsburg, Pa.—The Manufacturers' Light and Heat Company has absorbed ...e tri-State Gas Company, operating in Pennsylvania, West Virginia and Ohio, capital $1,500,000, and funded debt $246,000; Relief Gas Company, operating in Pennsylvania, capital $100,000; Wetzel Gas Company, operating in Ohio and West Virginia, capital $300,000; Canonsburg Gas Company, operating in Pennsylvania, capital $120,000; Mutual Benefit Gas Company, operating in Pennsylvania, capital $200,000; Waynesburg Gas Company, 000; Citizens' Gas Company, operating in Pennsylvania, capital $50,000; Blacksville Oil and Gas Company, operating in Pennsylvania, capital $10,000.

BRIDGES.

Glenwood, Ia.—The Mills Co. Bd. contemplates building an iron bridge.

Tell City, Ind.—Bids are asked until Aug. 4 for building a bridge. Albert P. Fenn, co. audt.

Oshkosh, Wis.—Plans for a concrete and steel bridge are being prepared, according to press reports.

Rutledge, Tenn.—A contract will be awarded Aug. 1 for building an $80,000 bridge over the Holston river.

Meridian, Miss.—Sealed bids are asked until Aug. 4 for a bridge across Tallahatta creek. B. V. White, clk.

Bassett, Neb.—Sealed bids are asked until Aug. 18 for a bridge over the Niobrara river. G. A. Hillburg, co. clk.

McCook, Neb.—Bids are asked until Aug. 4 for building a bridge across the Republican river. E. J. Wilcox, co. clk.

Greensburg, Pa.—Petitions are being circulated for a joint county bridge over the Monongahela, between Donova and Webster.

Gallatin, Mo.—Bids are asked until Aug. 4 for building 10 steel bridges in Danvers county. Geo. W. Lockridge, bridge comr.

Pleasanton, Cal.—Plans have been adopted for a concrete bridge across Arroyo del Valle Creek, north of this city. Bd. of co. supervisors.

Atlantic City, N. J.—Bids are asked until Aug. 6 for building 3 bridges on the county road near Weekstown. John T. Irving, Elwood, N. J.

Coffeeville, Miss.—Bids are asked until Aug. 4 for building abutments and approaches for Wellington bridge. Middlesex Falls, Parrening, Somerville, and Medford. William T. Pierce, engr. Met. park com.

Logansport, Ind.—Bids are asked until Aug. 5 for repairing an iron bridge in Tipton twp. and for constructing a stone arch culvert in Miami twp. J. G. Powell, co. audt.

San Jose, Cal.—Plans and specifications for a concrete and rubble stone bridge over the Los Gatos creek at Alma, and for a stone bridge over the Slogas creek on the old Gilroy road, have been authorized.

Chicago, Ill.—Sealed bids are asked until Sept. 3 for the sub-structures and superstructures of certain bridges across the Chico river. Thos. A. Smythe, prest. bd. drainage trustees.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

Omaha, Neb.—A better method of garbage disposal is proposed.

Racine, Wis.—Bids will be received for a garbage crematory.

Fulton, N. Y.—The question of garbage disposal is being considered.

Grand Rapids, Mich.—The construction of a garbage disposal plant has been recommended.

Haverhill, Mass.—The city authorities are considering a proposition for the collection and disposal of garbage.

Watervliet, N. Y.—The question of purchasing a street sweeper at a cost of $300 is being considered. Mayor Hilton.

Dayton, O.—A resolution was adopted July 10 relative to the purchase of four street washing machines for cleaning the paved streets.

Lawrence, Mass.—Mayor Leonard and Chmn. Bourget of the board of health are considering the question of building a garbage crematory.

San Juan, Porto Rico—(Special.)—The Dixon Garbage Crematory Company, Toledo, O., has been awarded the contract for constructing a garbage crematory at the United States army post at this point.

PARKS.

Pekin, Ill.—The question of purchase of grounds for a public park is being considered.

Little Falls, Minn.—Mayor Vasaly is in favor of converting the court house lawn into a city park.

Jackson, Mich.—A number of city officials visited Ann Arbor July 10 to investigate that city's park system.

TOO LATE FOR CLASSIFICATION

Celina, O.—The capacity of the electric light plant is declared inadequate.

Marquette, Mich.—The council has decided to extend the Maple-st. trunk sewer.

Pittston, Pa.—A large sewer in the alley in the rear of S. Main-st. is proposed.

Belridge, Ill.—A 50-year franchise has

been granted the People's Electric and Heating Company.

Minneapolis, Minn.—The sewer com. ordered July 21 sewers built in a large number of streets.

Mendota, Ill.—This city contemplates erecting an addition to the water works plant. E. F. Brown, mayor.

Altoona, Pa.—An experimental septic tank and rapid filter will be constructed by Harvey Linton, cy. engr.

Lewiston, Idaho.—The city council has decided to build sewers in Fourth and C-sts. in the business part of the city.

Laurium, Mich.—This village is considering the question of building cement walks in different sections of the city.

McKeesport, Pa.—The ordinance for the proposed light plant was passed July 21. The proposed plant will cost $75,000.

Hillsdale, Mich.—The property-owners in Manning and River-sts. have petitioned for cement sidewalks. K. Wilson, cy. clk.

Peoria, Ill.—The Briggs Real Estate Company contemplates the construction of a complete system of water and gas for the Uplands.

Lawrence, Kas.—Sealed bids are asked until 12 m. Aug. 4 for curbing and for a sewer in District No. 11. Samuel P. Moore, cy. clk.

Menominee, Wis.—This city has decided to pave two blocks of Main-st. and two blocks of Broadway with Menominee brick as an experiment.

Omaha, Neb.—The Omaha Railway Company was awarded a contract July 21 for paving Fillmore-ave., from S. Wabasha to Hyde-sts. for $4,510.

Lawton, O. T.—Sealed bids are asked until Aug. 15 for constructing a complete sewerage and water works system. L. P. Ross, chmn. coun. com.

Duluth, Minn.—A resolution was adopted July 21 directing the city engineer to get figures on the cost of constructing an electric light plant.

Cincinnati, O.—Sealed bids are asked until Aug. 12 for paving Jones-st., from Stanton-ave. to May-st., with brick. Robert Allison, prest. B. P. I.

Des Moines, Ia.—Sealed bids are asked until Aug. 15 for brick paving on E. First-st. and Indiana-ave. and certain alleys. J. E. Stout, chmn. B. P. W.

Pittsburg, Pa.—A resolution was introduced July 21 authorizing the council on filtration to engage experts to ascertain the cost of a filtration plant.

Wilmette, Ill.—Sealed bids are asked until 8 p. m. Aug. 7 for paving West-ave., between Lake and Wilmette-aves., with brick. Henry B. Gates, chmn. bd. impvts.

Toronto, Ont.—The Toronto Constructing and Paving Company, Ltd., has been incorporated by Albert Chamberlain, George Orpen, James Williams and W. J. West.

Davenport, Ia.—Sealed bids are asked until 2 p. m. Aug. 5 for furnishing macadam and repairing of macadam streets within the limits of this city. Thos. Murray, cy. engr.

Chicago, Ill.—Sealed bids are asked until 11 a. m. Aug. 4 for constructing, operating and maintaining a temporary pumping plant for section D intercepting sewer at Lawrence-ave. and Lake Michigan. F. W. Blocki, com. pub. wks.

Taylor, Pa.—The contract for building a lateral sewer on Union and Railroad-sts. was awarded to Harry Smith at $2.55 a lin. ft.; $27 per manhole and $75 per catch-basin.

Seattle, Wash.—Contracts were awarded July 21 as follows: Grading First-ave., S., Stirrat & Goetz, $22,780; E. Spruce-st. sewer, T. I. Peterson, $2,243.75; concrete walks on Sixth-ave., J. Kalberg, $3,614.10.

Washington, Pa.—An ordinance was passed July 21 for building a sewer in Spruce alley. Wm. H. McEnrue, clk. A contract was awarded July 21 for extending the main sewer down the creek to H. W. Herr of Altoona for $18,000.

Columbus, O.—Sealed bids are asked until 12 m. Aug. 8 for constructing a concrete masonry dam and gate chamber, 7,000 cu. yds. dry earth excavation; 6,000 cu. yds. wet earth excavation; 15,000 cu. yds. rock excavation; 56,000 cu. yds. concrete masonry. C. M. Addison, clk. B. P. W.

Muncie, Ind.—The city council has appointed a committee to investigate the cost of changing from the present electric light system to the Warner arc light, an invention of W. F. Warner, superintendent of the electric light plant of this city. Mr. Warner claims that his lamp will save the city in one year more than their total cost.

Louisville, Ky.—A conference of Indiana and Kentucky capitalists was held in this city July 29. An announcement was made after the conference that $300,000 had been taken by Louisville men to complete the financing of a Portland cement company. Mills will be built at Bedford, Ind., where sixteen acres of land has been secured. The plant will cost $500,000, and the quarries already acquired are estimated at a quarter of a million.

Indianapolis, Ind—Mayor Bookwalter has concluded that if bids for the proposed electric lighting contract were advertised under the new specifications being prepared by City Engineer Nelson there would only be one bidder, and to award the contract would involve the city in litigation. It is probable that he will order a cessation of all work on the plans and suspend work until special legislation has been secured from the legislature.

Maynard, Mass.—The water works may be rebuilt. Geo. H. Hart, supt.

Decatur, Ind.—An ordinance has been passed to install water meters.

Lowell, Mass.—The question of supplying water to Dracut and Chelmsford is being considered.

Dickson, Tenn.—The question of voting on the issue of $25,000 bonds for building a water works plans is being considered.

Jersey City, N. J.—The Fagan Iron Works Co., of Hoboken, was awarded the contract for special castings, plugs, caps, bends, manhole heads and covers at 3½ cts. per lb.